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PHASE I FEASIBILITY STUDY
WELLSVILLE-ANDOVER LANDFILL
(Site No. 9-02-004)

April 1992

Prepared for:

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1. INTRODUCTION

Ecology and Environment Engineering, P.C. (E & E), under contract to the New York State Department of Environmental Conservation (NYSDEC), was tasked to perform a Remedial Investigation/Feasibility Study (RI/FS) at the Wellsville-Andover Landfill (site no. 9-02-004), an inactive municipal landfill located in the townships of Wellsville and Andover, Allegany County, New York (see Figure 1-1). This RI/FS is being performed under work assignment No. D002625-8 of E & E's State Superfund Standby Contract.

This document presents the first phase of the FS for the Wellsville-Andover Landfill site and is a companion document to the Phase I Remedial Investigation Report completed by E & E in March 1992.

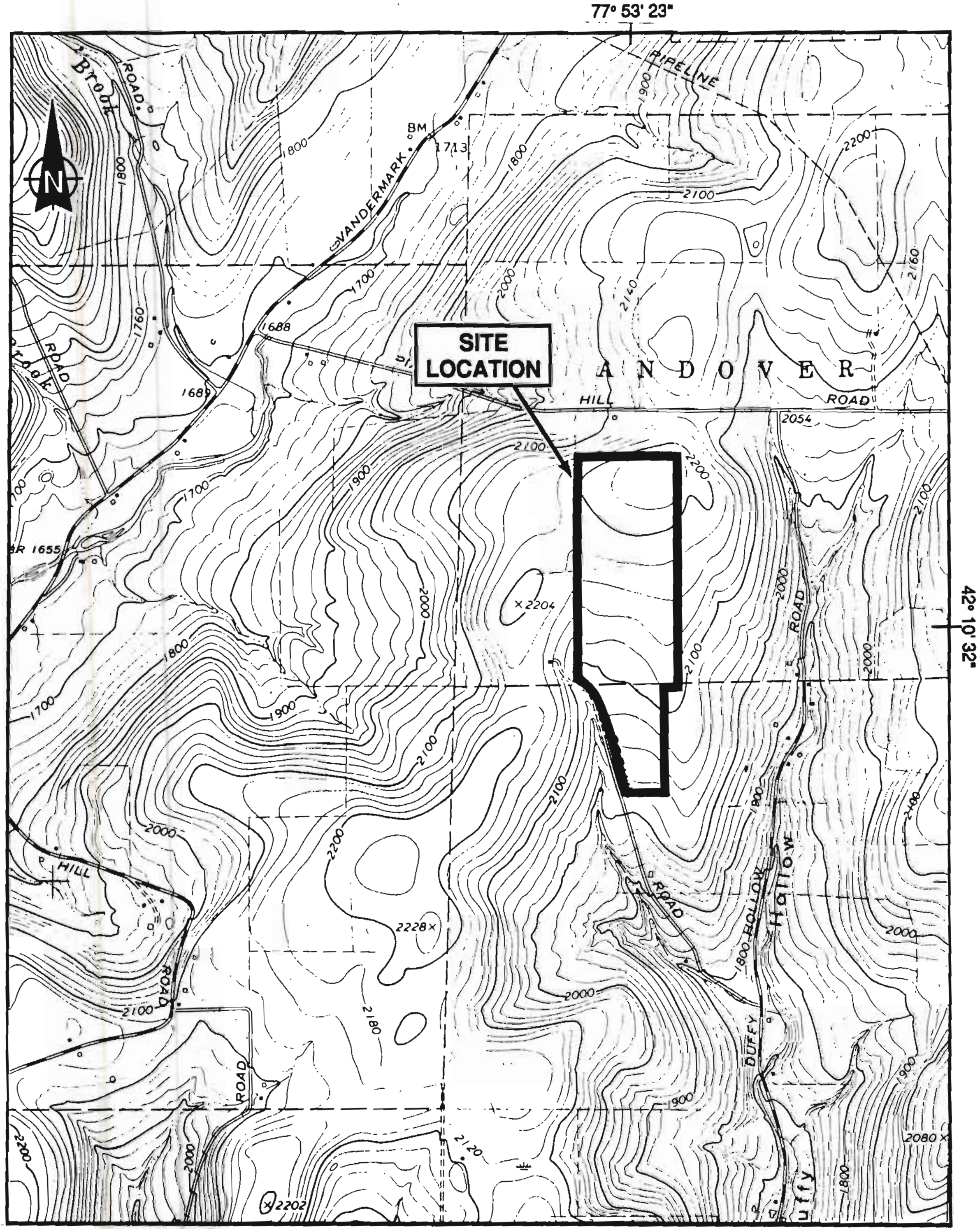
This Phase I FS report was prepared following the guidelines presented in the United States Environmental Protection Agency's (EPA's) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA - EPA 540/G-89/004 (EPA 1988) and Streamlining the RI/FS for the CERCLA Municipal Landfills, OSWR, 93553.11FS (EPA 1990), and NYSDEC's Technical and Administrative Guidance Memorandums, Selection of Remedial Actions at Inactive Hazardous Waste Sites (NYSDEC 1989) and Strategic Plan: Early Remedial Measures (NYSDEC 1990). The Phase I FS defines the contaminated media of concern at the site and develops the framework within which the contaminated media will be addressed (i.e., development of potential remedial alternatives). The Phase I FS includes the following tasks:

- Define the contaminated media of concern;
- Identify remedial action objectives;
- Identify general response actions;
- Identify applicable remedial technologies;
- Screen the technologies based upon effectiveness and implementability; and
- Develop technologies into potential remedial alternatives.

Although the aforementioned tasks will be completed as part of the Phase I FS, it must be stressed that the phased RI/FS process is interactive--the RI and the FS are conducted concurrently. The data collected during the RI influence the development of remedial alternatives in the FS, which in turn affects the data needs and scope of treatability studies, if any, and additional field investigations (i.e., the Phase II RI).

The Phase I RI is directed toward developing a general understanding of site characteristics and, subsequently, this Phase I FS is developed based upon the initial assessment of site contaminants, potential routes of exposure and associated receptors, and preliminarily identified chemical- and location-specific applicable or relevant and appropriate requirements (ARARs). The Phase II RI will focus on filling identified gaps in the understanding of site characteristics and also on gathering information necessary to define and evaluate remedial alternatives. Based upon the findings of the Phase II RI and the final Human Health Risk Assessment, Section 3.1 of this document may be modified in subsequent revisions to ensure that developed alternatives remain protective of human health and the environment and/or to form the basis for evaluating and comparing alternatives that are most appropriate for remediation of the site before the detailed analysis of alternatives in the Phase III FS.

DRAFT



SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangle, Wellsville North, NY 1965.

SCALE 1:24,000

0 ½ 1 Mile

0 .5 1 Kilometer

Figure 1-1
SITE LOCATION MAP, WELLSVILLE-ANDOVER LANDFILL

2. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS FROM RI

2.1 SUMMARY

The Phase I RI for the Wellsville-Andover Landfill, Site No. 9-02-004, in the towns of Wellsville and Andover, Allegany County, New York, was performed by E & E under contract to NYSDEC. Site work for the Phase I field activities was performed from August of 1991 through February of 1992. The objectives of the RI/FS are to:

- Assess the cause, extent, and effects of the hazardous materials present in the project area;
- Identify and evaluate remedial alternatives selected to mitigate contamination problems threatening the environment or public health; and
- Recommend remedial alternatives.

Prior to the Phase I RI, a Phase I study was performed for NYSDEC in 1983 by Engineering-Science, Inc. in association with Dames and Moore, and a Phase II study was performed in 1986 by Malcolm Pirnie for the Village of Wellsville. Factors of concern indicated by these studies were contaminated groundwater potentially impacting local residents and the generation of leachate contaminated with VOCs.

During the Phase I RI site characterization, preliminary field activities performed prior to sampling of environmental media included a ground-based survey, the development of a base map, and the performance of three geophysical surveys.

The geophysical investigation included a total earth field magnetics survey, a ground conductivity survey, and a seismic refraction survey. The purposes of the geophysical investigation were to:

- Locate subsurface ferrous objects;
- Define waste-disposal areas;
- Detect potential groundwater contaminant plumes;

- Determine the morphology and stratigraphy of the subsurface; and
- Assist in the selection of monitoring well locations.

The results of this investigation allowed E & E to detect five highly anomalous locations within the fill areas. Each area was excavated and the cause of the anomaly determined. In addition, the boundaries of the four fill areas were identified by the geophysical investigation and depicted on the base map. Waste disposal appears to have been performed in a cellular fashion in the northeast fill area, while in the other areas, filling appears to have occurred in a more haphazard manner. No groundwater contaminant plume was noted outside the fill areas, suggesting that heavy metals have not had a major impact on groundwater. Seismic profiles for the site were generated, depicting subsurface stratigraphy, and these profiles were used to aid in the selection of monitoring well locations (see Figure 2-1).

Steel 55-gallon drums were located in three of the five locations excavated. Of these, an empty, crushed oil drum was located in the south fill area, and five rusted drums were located in the northeast corner of the south-central fill area. These drums contained a solid, plastic-like material and were surrounded by plastic buttons and scraps, presumably from Rochester Button Co. In addition, two rusted, liquid-filled drums with no identifiable markings were discovered in the northwest corner of the northwest fill area. Soil and waste samples collected from these trenches indicate the presence of numerous contaminants, including chlorinated aliphatic compounds (1,2-DCE, TCE, VC, etc.), aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylene, and styrene), PAHs, phthalates, phenols, and pesticides. Sample TP-2 contained relatively low amounts of the above contaminants, except for PAHs, phthalates, and pesticides, which were found at comparatively higher concentrations. The PAHs detected may have resulted from incomplete combustion of waste prior to disposal, while the phthalates most likely resulted from the relatively large amount of plastic in this disposal area compared to other areas. Sample TP-1 from the northwest fill area contained relatively high concentrations of most of the above contaminants, while TP-4 from the south-central fill area contained the highest concentration of total chlorinated aliphatics and phthalates.

When compared to observed ranges in soils of the eastern United States, concentrations of cobalt, lead, and zinc were found to be slightly elevated across the site, while arsenic, copper, and nickel were slightly elevated only in the northwest fill area. Based on available data, the concentrations of these metals suggest that all are fairly ubiquitous in the area.

Subsurface soil samples were collected from each of the deep well borings for chemical analysis. The only organic substances detected were chlorinated aliphatic compounds in the two samples from MW-5D. A total of 130 μg/kg were detected at 8 to 9 feet, and approximately 81 μg/kg were detected at 18 to 19 feet. Several inorganic substances exceeded the 90th percentile of the observed range in eastern U.S. soils, but only lead appears not to be attributable to background conditions.

During the Phase I RI, 17 monitoring wells were installed and sampled along with four pre-existing wells. Organic compounds detected in the groundwater samples included several chlorinated aliphatic compounds and the aromatic hydrocarbons ethylbenzene and toluene. The monitoring wells containing these compounds above NYSDEC Class GA standards included MW-2D, MW-5D, MW-5S, MW-6D, MW-11S, CW-3A, and CW-3B. All of these wells are on the east or south side of the site. Concentrations of total chlorinated aliphatic compounds ranged up to a maximum of approximately 8,100 μg/L in GW-5S. Since a component of groundwater flow does exist toward the wells on the west side of the site, the relative lack of contaminants in these wells suggests that the leachate collection system on the west side of the site may be intercepting contaminated groundwater and/or the fractured bedrock has permitted the groundwater to migrate vertically.

Inorganic substances detected above Class GA standards in the groundwater--with the exception of iron, manganese, magnesium, and sodium, which are commonly high in unfiltered samples--were chromium in GW-2D and lead in GW-12S and GW-2D.

Seven residential wells and springs in the area were sampled. The only organic compound detected was TCE, which was found below the Class GA standard in the LaDue spring south-southeast of the site. Inorganic substances above Class GA standards include iron and sodium in more than half the samples, manganese in the Rosini well, and zinc in the Bauer well. All four of these metals are considered secondary contaminants by NYSDOH and appear to be naturally ubiquitous.

Six surface water and sediment samples were collected from Duffy Creek and its unnamed tributary (see Figure 2-2). No organic or inorganic analytes in either medium were found to significantly exceed the concentrations in the background sample.

Twelve biased and two background surface soil samples were collected at the site. Analysis indicated the presence of chloromethane and/or ethylbenzene in samples collected from seeps in the northwest fill area. In addition, several PAHs were detected at various concentrations in leachate seeps and ditches on and off the site. Inorganic substance analyses of these surface soil samples indicated elevated concentrations of calcium, cobalt, iron, lead, manganese, nickel, and zinc; however, all these substances appear to be naturally ubiquitous.

Liquid leachate samples were collected from two locations along the leachate collection system. Inorganic substances exceeding Class C surface water standards in the leachate are aluminum, lead, and zinc in both samples and vanadium only in L-1. Volatile and semivolatile compounds were also detected in these samples; however, the concentrations were significantly less than expected based on air sampling results.

Six air samples were collected at various points along the leachate collection system. Analysis indicated the presence of relatively high concentrations of chlorinated aliphatic compounds and aromatic hydrocarbons. The relatively high concentrations of VOCs in the air samples suggests that the leachate may not be the only source of the VOCs. However, if the leachate collection system were receiving vapors directly from the landfill, then VOCs should have been detected in subsurface soil samples collected near fill areas. This was not indicated by the RI analytical results.

Air sampling results indicated that the majority of the VOCs in the collection system are emanating from the northwest fill area. Samples collected from manholes MH-6 and MH-10 and Riser R-10 contained one to two orders of magnitude more VOCs than the other samples analyzed. Ambient air monitoring results from the field work identified a similar pattern (i.e., readings were higher in the northwest area).

In addition to the above site characterization, a habitat-based ecological survey was performed at the site to characterize the ecological resources associated with this site. The scope of work performed addressed items only in Step 1 of Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC 1991). A background search and a field survey were performed to characterize both the terrestrial and aquatic ecosystems at the site. Site-related flora and fauna were identified, with emphasis on sensitive receptors. In addition, a cover-type map of the site was generated.

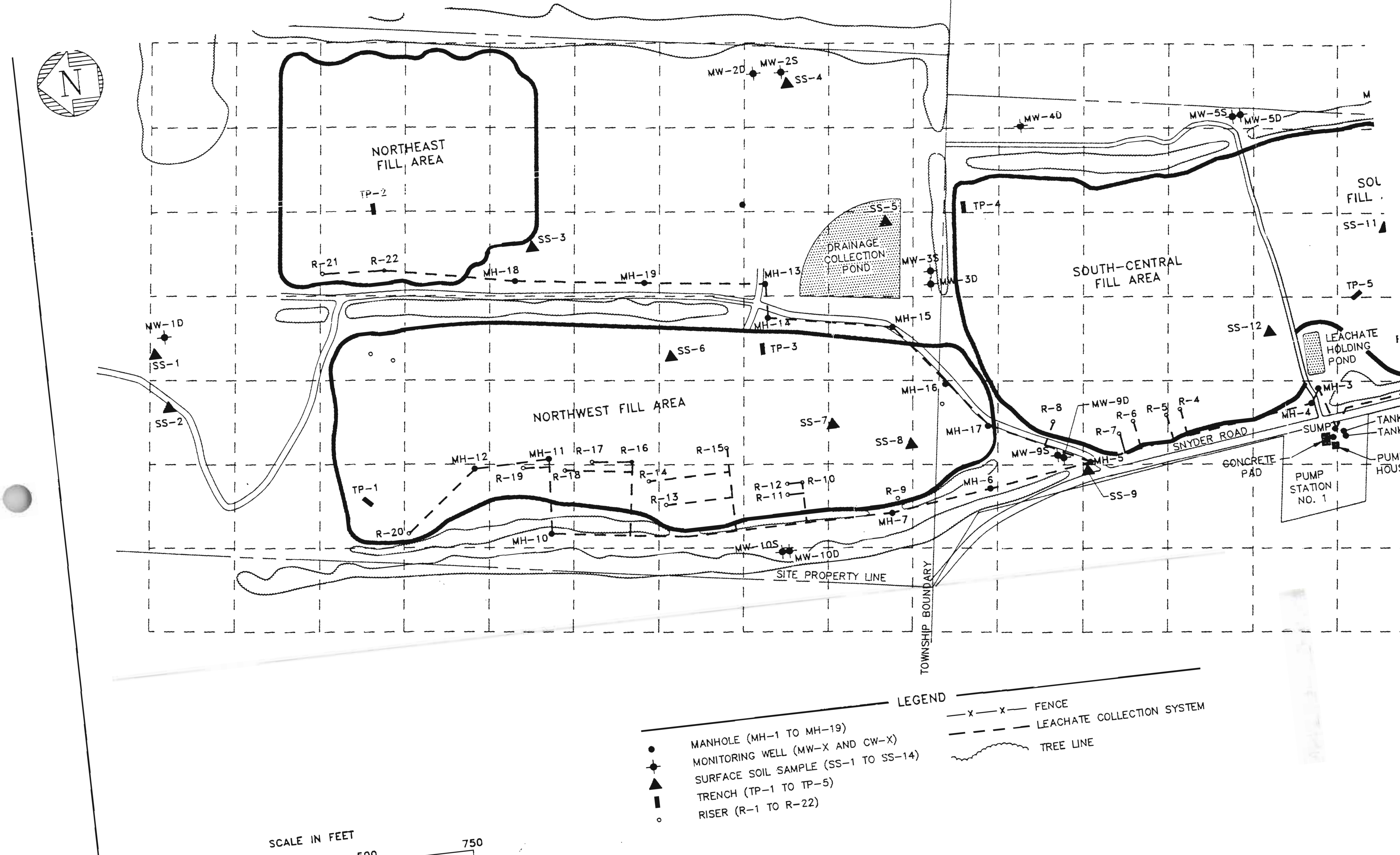
2.2 CONCLUSIONS AND RECOMMENDATIONS

The Phase I RI has identified several contaminants of concern that occur in significant concentrations at the Wellsville-Andover Landfill site. As identified by the preliminary risk evaluation, the most significant contaminants of potential concern are 1,1-DCA; 1,1-DCE; 1,2-DCE; toluene; TCE; and VC. These contaminants were detected at elevated concentrations in a variety of media, including subsurface soil and waste, surface soil, groundwater, leachate, and air.

These contaminants are migrating off site to an unknown extent in the groundwater. The extent of migration of contaminants in both the leachate and surface water has also not been fully characterized. In addition, no ambient air samples were collected over a prolonged period. Ambient air quality is of concern due to the known presence of VOCs in all media sampled and their potential to migrate off site.

The data suggest that perched water occurs sporadically in the area of the site. Below the perched water, fractured bedrock may provide a pathway for groundwater to migrate vertically and eventually travel off site. Due to a lack of subsurface information, the significance of vertical migration and the interplay between the perched water and the lower aquifer cannot be assessed.

In order to fully assess the impact of the site-related contaminants on human health and the environment and provide further information for the selection of remedial alternatives, a Phase II RI is recommended.


N
NORTHEAST FILL AREA
NORTHWEST FILL AREA
SOUTH-CENTRAL FILL AREA
SOL FILL
DRAINAGE COLLECTION POND
LEACHATE HOLDING POND
SNYDER ROAD
CONCRETE PAD
PUMP STATION NO. 1
SUMP
TANK
TANK
PUMP HOUS
SITE PROPERTY LINE
TOWNSHIP BOUNDARY
MW-1D
MW-2D
MW-2S
MW-3S
MW-3D
MW-4D
MW-5S
MW-5D
MW-9S
MW-9D
MW-10S
MW-10D
M
SS-1
SS-2
SS-3
SS-4
SS-5
SS-6
SS-7
SS-8
SS-9
SS-11
SS-12
TP-1
TP-2
TP-3
TP-4
TP-5
MH-3
MH-4
MH-5
MH-6
MH-7
MH-10
MH-11
MH-12
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R-9
R-10
R-11
R-12
R-13
R-14
R-15
R-16
R-17
R-18
R-19
R-20
R-21
R-22
LEGEND
MANHOLE (MH-1 TO MH-19)
MONITORING WELL (MW-X AND CW-X)
SURFACE SOIL SAMPLE (SS-1 TO SS-14)
TRENCH (TP-1 TO TP-5)
RISER (R-1 TO R-22)
—x—x— FENCE
LEACHATE COLLECTION SYSTEM
TREE LINE
SCALE IN FEET
500
750

OB3WELLS-SAMPLOCS

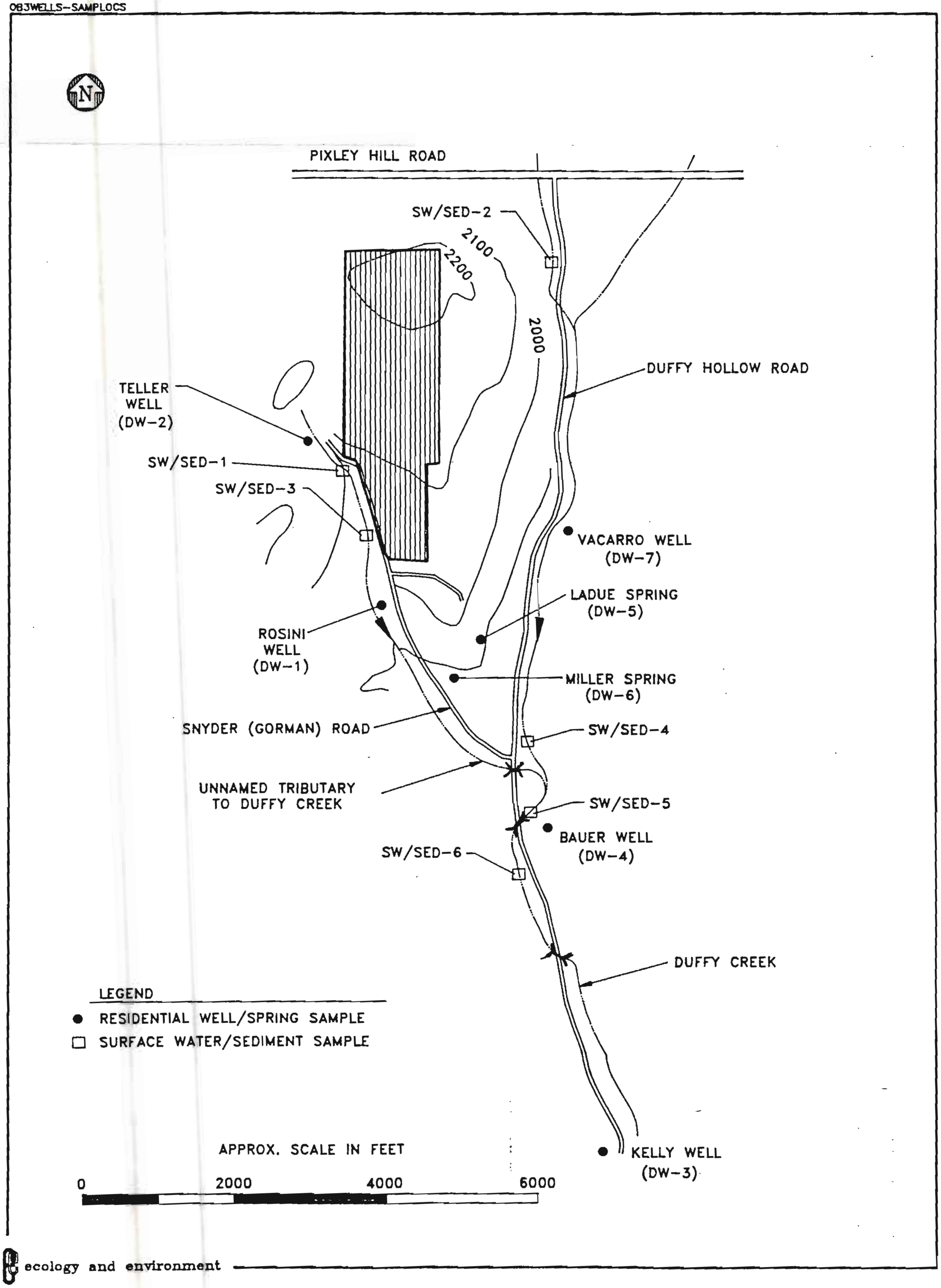

Figure 2-2 RESIDENTIAL WELL AND SPRING, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS 1991

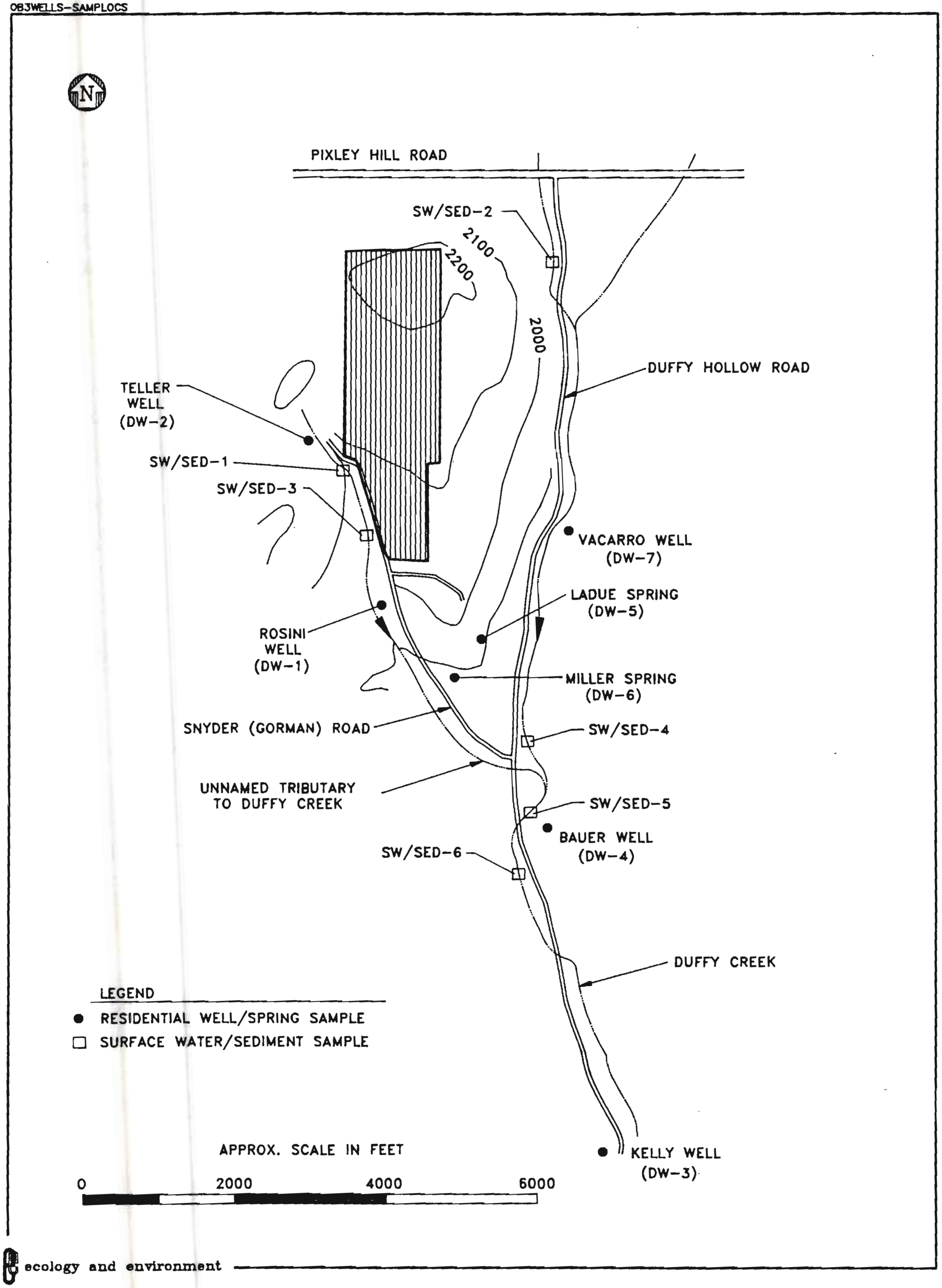

Figure 2-2 RESIDENTIAL WELL AND SPRING, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS 1991

3. DEVELOPMENT OF ALTERNATIVES

This section presents the first phase of the FS for the Wellsville-Andover Landfill site in which the framework for the FS is established. First, the contaminants of potential concern (COPC) are identified and the media of concern defined. Then, for each medium of concern, remedial action objectives are established that will protect both human health and the environment. General remedial response actions describing measures that will satisfy the remedial action objectives are then developed. Finally, remedial technologies applicable to each action are identified and screened on the basis of effectiveness and implementability.

As stated in the RI/FS work plan, the scope of the FS will focus on source control and treatment technologies. This focused approach is based on guidance documents from NYSDEC and EPA (Strategic Plan: Early Remedial Measures, NYSDEC, September 1990; and Streamlining the RI/FS for CERCLA Municipal Landfill Sites, EPA, January 1991). The RI/FS process for Class 2 sites requires the identification of feasible remedial technologies that are screened and organized into various remedial alternatives. At Class 2 non-RCRA regulated landfills, this process may be somewhat simplified and accelerated due to their typically large size and relatively homogenous composition. These sites are inappropriate for remedial technologies such as large scale excavation and off-site treatment of the entire mass.

3.1 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES

Remedial action objectives are medium-specific goals for protecting human health and the environment. These objectives are typically established under the broad guidelines of meeting all ARARs and/or the recommendations of the Human Health Risk Assessment. Since the quantification of risk will be performed after the Phase II RI effort, preliminary remedial action objectives focusing on meeting ARARs will be developed for the Phase I FS. These preliminary objectives will be modified, as necessary, based upon further site characterization data to be obtained during the Phase II RI and/or the findings of the final Human Health Risk Assessment.

Development of Remedial Action Objectives

As stated in the RI/FS work plan, the development of remedial actions will concentrate on source control and treatment technologies based on guidance given by NYSDEC and USEPA for RI/FS work on landfills (Reference NYSDEC Strategic Plan: Early Remedial Measures and USEPA Conducting RI/FS for CERCLA Municipal Landfill Sites).

Because many municipal landfill sites share similar characteristics (i.e., large volumes and relative homogeneity) the EPA has developed a list of expectations as to the types of remedial alternatives to be developed during the FS. For municipal landfills they are:

- The principal threats posed by a site, such as hot spots, will be treated whenever practical;
- Engineering controls such as containment will be used for waste to remain in place;
- A combination of methods will be used to protect human health and the environment (i.e., treatment of hot spots and containment);
- Institutional controls such as deed restrictions and fencing will be used to supplement engineering controls as necessary;
- Innovative technologies will be considered which offer superior treatment or cost compared to demonstrated technologies; and
- Groundwater will be returned to a usable state as quickly as possible.

Considering these expectations and the need to prevent or significantly reduce the impact of the landfill on human health and the environment to the highest degree practicable, the following list of objectives was developed:

- Reducing contaminant leaching to the groundwater aquifers;
- Controlling and treating contaminated leachate and groundwater;
- Reducing the contamination of surface waters and sediments;
- Preventing direct contact with landfill wastes;
- Controlling surface water runoff and erosion;
- Controlling and treating landfill gas; and
- Meeting all ARARs.

ARARs

The ARARs which apply to municipal landfills can be classified as chemical-specific, action-specific, or location-specific. Appendix A includes tables 5-3 and 5-3 from Conducting

RI/FS for CERCLA Municipal Landfill Sites (EPA 1991), which list location-specific and action-specific federal ARARs. Since the New York State Hazardous Waste Regulations closely parallel the federal (RCRA) regulations for solid wastes, these tables will be used as a guideline. In the development of alternatives, the more restrictive (state or federal) will be used, such as NYS landfill closure requirements. ARARs pertinent to air stripping, incineration, and direct discharge to POTWs is included in the tables because these technologies are typically used at municipal landfill sites.

The chemical-specific ARARs are used almost entirely for surface water and groundwater contamination with respect to landfills. They include health-based primary and secondary maximum concentration levels (MCLs) as well as the environmental-based surface water standards that are identified in the New York State Ambient Water Quality Standards and Guidance Values.

3.1.1 Soil and Waste

The most important ARARs for soils and wastes are the federal and state requirements for landfill closures (40 CFR Part 264.3 and 6NYCRR Part 360.2). In addition to these general ARARs, action-specific ARARs as identified in Appendix A and the New York State equivalents will control remedial activities such as consolidation and treatment of hot spots. ARARs are action dependent; therefore, they will not be listed at this time. They will be identified for the specific alternatives that are developed.

3.1.2 Groundwater

The groundwater beneath and in the vicinity of the site (both the groundwater within the overburden and within the fractured bedrock) is classified as Class GA groundwater, indicating the best possible usage is as a potable water supply. As such, MCLs and NYSDEC Class GA groundwater standards are ARARs. A summary of potential groundwater ARARs is presented in Table 3-1.

3.1.3 Air

The ARARs for air emissions from municipal solid waste landfills include the Clean Air Act (40 CFR, Part 270) and all applicable amendments as well as the NYSDEC Annual Guidance Concentration (AGC) and Short-Term Guidance Concentrations (SGC). These regulations apply to the landfill as well as future processes such as a gas venting system (required by 6NYCRR Part 360) and possible treatment technologies (e.g., air strippers).

3.2 IDENTIFICATION OF GENERAL RESPONSE ACTIONS

Based upon the information derived from the Phase I RI, general response actions--or classes of response--were identified for each medium of concern. General response actions can be considered conceptual alternatives for each medium of concern that will satisfy the remedial action objectives. The "no-action" alternative was included as a general response action for each medium of concern to serve as a basis for comparison with other potential response actions. Also, the development of the no-action alternative is required under the National Contingency Plan (NCP). Table 3-2 presents a summary of the general response actions identified for each medium of concern.

3.2.1 Soil and Waste

The general response actions for soil identified in this section address the pathways of direct contact (e.g., inhalation, dermal adsorption, and ingestion), leaching, and air transport. Containment (capping) would prevent direct contact with potential receptors, reduce leaching resulting from surface water infiltration, and eliminate the transport of contaminated dust or soil particles by air. Excavation, treatment, and disposal would remove, immobilize, or destroy waste material and soil contaminants as well as remove the source of contamination. However, due to this large volume of material, the use of those options is not feasible. Institutional controls (e.g., fencing or deed restrictions) would limit site access, thereby minimizing the potential for exposure to contaminants. The no-action alternative would leave the soils and wastes in their present condition.

3.2.2 Groundwater

General response actions appropriate for groundwater contamination are containment, groundwater extraction, treatment, disposal, limited action response, institutional actions, and no-action (monitoring). These remedial actions (excluding no-action) would prevent contaminant-plume migration, remove the contaminants from the groundwater, and/or minimize potential exposure to contaminated groundwater. The no-action alternative would provide data on groundwater quality but allow further degradation of groundwater and contaminant-plume migration.

3.3 IDENTIFICATION OF APPLICABLE REMEDIAL TECHNOLOGIES

Applicable remedial technologies were identified for each general response action. The remedial technologies were identified based upon engineering judgment, taking into account the following:

- Site conditions and characteristics that may affect implementability;
- Physical and chemical characteristics of contaminants that determine the effectiveness of various technologies; and
- Performance and operating reliability.

Table 3-3 lists applicable remedial technologies for each medium of concern and general response action. Cost criteria were not considered in the identification of applicable remedial technologies. The following describes each of the identified applicable technologies and briefly discusses their applicability to the Abandoned Solvent Center site. The technologies are then screened in the following section on the basis of effectiveness and implementability.

Whoops!

3.3.1 Soil

Remedial technologies for the contaminated soil are used to contain, remove, or treat the soil at the Wellsville-Andover Landfill Site. The remedial technologies discussed below are those initially considered for contaminated soil.

Containment

Capping. Capping, or surface sealing, is applicable to all land disposal sites. To control air mobilization of contaminated soils, infiltration of rainwater into soils, and movement of contaminated soils into the surface water and drainage system through erosion, this technology requires consideration. In general, capping isolates wastes from contact with surface water runoff and infiltration, controls off-site transport of contaminated sediments, and minimizes the potential for surface leaks of leachate. Capping techniques utilize materials such as synthetic membranes, slags, asphalt, concrete, and chemical sealants.

Capping is generally performed when subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards and/or prohibitive costs. Capping also may be performed as an interim remedial measure to reduce infiltration of precipitation and control air releases. The main disadvantages of capping are uncertain design life and the need for long-term maintenance. However, long-term maintenance requirements can be considerably more economical than excavation and removal of the waste.

Multilayered caps are most common and are the minimum required for non-RCRA Class 2 landfills by regulation 6 NYCRR Part 360. These caps can be composed of natural soils, mixed soils, a synthetic liner, or any combination of these materials. Standard design practices specify permeabilities of less than or equal to 10^{-7} centimeters per second (cm/sec) for the soil liner.

Environmental, public health, and institutional impacts of the various capping technologies would all be similar. During construction, short-term impacts would include noise, dust, and increased truck traffic through that area. Long-term groundwater pollution would be lessened because of reduced infiltration and leaching. Waste material and soil contaminants would remain on site and be a potential source of future groundwater contamination and public exposure. Future development of the site would have to be strictly controlled and perhaps the site would have to be designated a hazardous waste facility.

Multilayered Caps. The following are examples of multilayered caps.

- **Loam Over Clay.** This technology involves clearing and grubbing, grading, and the placement and compaction of 24 inches of clay to minimize infiltration and eliminate particulate emissions from the soil surface. The clay is covered with 12 inches of loam (topsoil) to control moisture, protect the integrity of the clay layer, and allow revegetation. This technology is effective and has longevity and durability, assuming proper design, installation, and maintenance. It is effective because it is less susceptible to cracking from settlement and frost heave, and tends to be self-repairing. Long-term maintenance would be required to prevent growth of deep-rooting trees and shrubs that could penetrate the clay seal.

- **Loam Over Sand Over Synthetic Membrane Over Sand.** This technology involves clearing and grubbing, surface-grading, and covering site soils with a 12-inch-thick blanket of sand overlain by an impermeable synthetic membrane that is covered by a 12-inch sand drainage layer. This sequence of materials is covered by 8 inches of loam (topsoil) to allow revegetation. This technology is effective, but the installation is time-consuming and difficult. Six operations are required to complete the construction, and the seams in the membrane require careful installation and sealing. Flexibility of the membrane makes this technology relatively less susceptible to cracking from influences such as settlement and frost heave; however, the self-repairing capability of clay is lost. There is limited long-term experience with synthetic membranes.

- **Loam Over Sand Over Synthetic Membrane Over Clay (RCRA Cap).** This technology involves clearing and grubbing, grading, and covering site soils with 24 inches of compacted clay and an impermeable synthetic membrane that is covered by 24 inches of compacted sand. The compacted clay and synthetic membrane act as barriers to the infiltration of water, while the top sand layer provides a drainageway for percolating water. Overlying this sequence of materials is 12 inches of loam (topsoil) to allow revegetation. This sequence of materials meets RCRA requirements for capping at a new facility. This technology takes advantage of the self-repairing properties of clay, along with the impermeable nature of a synthetic membrane. Six operations are required to complete the construction of this cap, and seams in the membrane require careful installation and sealing.

Excavation

Excavation, removal, and hauling of contaminated soils are generally accomplished with conventional heavy construction equipment (e.g., backhoes, bulldozers, and dump trucks). Excavation of contaminated waste materials is typically followed by land disposal or treatment.

Factors to be considered while evaluating the usefulness of this technology include an assessment of the mobility of the wastes, comparison with the feasibility of on-site containment or in situ treatment, and the cost of disposing or treating the waste once it has been excavated. It is often possible to excavate and remove contaminant "hot spots" and use other remedial measures for less contaminated soils.

On- or Off-Site Disposal

Land disposal of contaminated wastes has historically been a popular remedial action because it often represented the quickest, most direct approach to remediating a site. Presently, the trend is toward utilizing treatment technologies to remediate a site. This trend is attributable to:

- Section 121 of the Superfund Amendments and Reauthorization Act (SARA) of 1986, which requires that preference be given to remedial actions that "...permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances." SARA further states "...that off-site transport and disposal without such treatment should be the least favored alternative remedial action where practical treatment technologies are available."; and
- In 1984, Congress passed the Hazardous and Solid Waste Amendment (HSWA), which mandated stringent new land-disposal restrictions known as the RCRA Land-Disposal Restrictions.

With respect to the first item, NYSDEC concurs with SARA in the belief that it is important to implement permanent remedies wherever practicable (NYSDEC 1989a). With respect to the second item, RCRA, including the RCRA Land Disposal Restrictions, is the most significant ARAR identified for the waste material and contaminated soil at the Abandoned Solvent Center site. The RCRA Land Disposal Restrictions prohibit the land disposal of RCRA hazardous wastes unless treatment standards are met prior to disposal in a RCRA-permitted facility. ?

The two disposal options--on-site disposal in that existing landfill or off-site disposal in a commercial facility--are discussed below.

On-Site Disposal

On-site disposal of soil generated by excavation of contaminated material or by an on-site treatment or pretreatment process would include the placement of such wastes in or on existing fill areas. This would be most appropriate for investigation wastes and contaminated material from the installation of final treatment systems.

This action may also be used in combination with others in order to consolidate wastes if necessary.

Off-Site Disposal

Off-site disposal of contaminated waste material and soil involves hauling excavated material to a commercial disposal facility. The type of facility chosen (either a nonhazardous/solid waste or a secure facility) would depend upon whether the material is classified as hazardous under RCRA and New York's Hazardous Waste Regulations. Those materials that are not hazardous can be disposed of in a nonhazardous/solid waste facility. Hazardous wastes may only go to a RCRA-permitted facility. Prior to land disposal, most hazardous wastes must meet specific treatment standards codified in the federal regulation 40 CFR, Part 268.

On- or Off-Site Treatment

On- or off-site treatment of waste material and contaminated soils includes techniques falling into the following three major categories:

- Thermal treatment;
- Physical treatment; and
- Biological treatment.

A discussion of each technology follows.

Thermal Treatment

Thermal treatment employs high temperatures to render hazardous wastes into less hazardous or nonhazardous components. When subject to high temperatures, organic wastes decompose to less toxic forms. Complete combustion yields carbon dioxide, water, and other combustion products such as sulfur dioxide, nitrogen oxides, and other gases. Some thermal treatment processes produce off-gases and ash that require further treatment or disposal in a secure landfill.

Thermal destruction is a proven technology that can effectively and rapidly treat all organic compounds, though at high capital and energy costs. It consistently achieves the best overall results for organic contaminants, usually accomplishing well over 99% destruction. However, thermal treatment is an ineffective remedial technique for metals. Volatile metal compounds (e.g., arsenic) may present particulate emission problems. These metal particulates are difficult to remove using conventional air-pollution-control equipment due to the small size of metal-containing particulates. Nonvolatile metals (e.g., chromium) tend to remain concentrated in the solid residues (e.g., incinerator ash). Depending upon the metal concentration in the incinerator ash, the ash may require disposal in a secure facility or further treatment.

Rotary kiln incineration is the most commonly used thermal treatment method for solid hazardous wastes, but thermal treatment also includes other types of incineration (e.g., infrared, fluidized bed, or circulating fluidized bed, as well as pyrolytic processes and plasma processes). NYSDEC is currently in the process of reviewing a request for conceptual approval for O.H.M. Remediation Services Corporation's (OHM) mobile infrared incineration system. Therefore, thermal treatment processes considered in this FS will include rotary kiln and infrared incineration; however, these will be addressed generally as thermal treatment. (The type of incinerator rotary kiln or infrared would be decided during the remedial design process, most likely through competitive bidding.) A description of an infrared incineration system and a rotary kiln incinerator are provided below.

- **Infrared Incineration** uses infrared energy (generated by silicon carbide resistance-heating elements) as an auxiliary heat supply for destruction of combustible materials. Materials to be treated pass through the primary combustion chamber on a woven wire conveyor belt and are exposed to the infrared radiation, where solids are pyrolyzed. Oxygen is introduced to help fully combust off-gases. Ash residue is dropped off the belt into a hopper where it is collected. Exhaust gases pass through a secondary chamber to ensure complete combustion of remaining organic substances. Exhaust gases are then passed through pollution-control equipment for particulate removal, acid-gas control, and gas cooling. Low particulate and gaseous emissions are achieved by this process, which is used primarily to treat contaminated solids, soils, and sludges.

- **Rotary Kiln Incinerators** consist of a long, rotating, kiln, which is slightly inclined. Wastes and auxiliary fuel are fed into the elevated end of the kiln. The waste material is combusted as it passes through the kiln. The kiln is slowly rotated to enhance the mixing of the waste with combustion air, thereby facilitating the combustion process. Residence times within the kiln can vary from several minutes to an hour or more to ensure that organic contaminants have been destroyed. Ash is removed at the lower end of the kiln. Flue gases are passed through an afterburner for further oxidation and are subsequently treated using conventional air-pollution-control equipment to limit particulate and acid-gas emissions. Rotary kiln incineration is applicable to liquid, solid, and slurried hazardous wastes and is the most commonly used incineration method for contaminated soils. Both stationary and mobile rotary kiln incinerators are commercially available.

Physical Treatment

Physical treatment processes involve physical manipulation of the soil/waste in order to immobilize or remove the contaminants. Physical treatment technologies that may be applicable for remediation of contaminated soil at the Abandoned Solvent Center site include soil washing, solidification/stabilization, low-temperature thermal desorption, critical fluid extraction, and chemical extraction.

- **Solidification/stabilization** is a physical treatment process that binds the contaminants in a solid matrix through the addition of chemicals. Solidification of wastes typically produces a monolithic block of high structural integrity. The contaminants do not necessarily interact chemically with chemical reagents but are mechanically locked within the solidified matrix. Stabilization methods usually involve the addition of materials that limit the solubility or mobility of waste constituents and/or improve the handling and physical characteristics of the waste. Remedial actions involving combinations of solidification and stabilization techniques are often used. Solidification/stabilization techniques have been most widely successful when applied to inorganic wastes. For remediation of soils containing VOCs, solidification/stabilization is not well demonstrated.

Institutional Controls

Institutional controls are minimal actions taken to reduce the potential for exposure to the waste material and contaminated soil and may include site fencing or deed restrictions.

The No-Action Alternative

The no-action alternative may include some type of environmental monitoring but would not include any type of institutional controls or remedial action.

3.3.2 Groundwater Remedial Technologies

Groundwater remedial technologies can be applied to contain, collect, divert, or remove the groundwater in the area of the Wellsville-Andover Landfill in an effort to prevent further migration of contaminants from the site and to manage the migration that has already occurred.

Subsurface Barriers

Subsurface barriers can be used to divert groundwater flow away from a site or to contain or restrict movement of contaminated groundwater. Typical subsurface barriers include slurry walls, grouting, and sheet piling. These technologies are often used in conjunction with capping.

- **Slurry Walls.** Slurry walls are low-permeability barriers constructed through the subsurface soils to create a barrier to the flow of groundwater. This barrier can be used both to redirect the groundwater flow upgradient of the site and to contain groundwater leaving the site on the downgradient side. Slurry walls are commonly constructed using either a soil-bentonite or cement-bentonite slurry.

- **Grouting.** Grouting is a process whereby one of a variety of fluids is injected into a rock or soil mass. Once injected, it sets in place to reduce water flow and strengthen the formation. Because of costs, grouted barriers are seldom used for containing groundwater flow in unconsolidated materials around hazardous waste sites. Grouting is best suited for sealing voids in rocks. Cement, clays, bentonite, alkali silicates, silicates, and some organic polymers have been used as grouts.

- **Sheet Piling.** In addition to slurry-wall and grouted cutoffs, sheet piling can be used to form a groundwater barrier. Sheet piles can be made of wood, precast concrete, or steel. Steel sheet piling, compared to other materials that can be used for sheet piles, is most effective in terms of groundwater cutoff and cost.

Extraction

Groundwater extraction systems are used to control, contain, or remove groundwater contaminant plumes. Groundwater extraction can be achieved by using pumping wells or subsurface drains.

- **Groundwater Pumping** methods involve the active manipulation and management of groundwater through the use of well systems. The selection of an appropriate well system depends upon a number of factors, including the depth of contamination and the hydrologic and geologic characteristics of the aquifer.

- **Subsurface Drains** include any type of buried conduit used to convey and collect contaminated groundwater by gravity flow. Subsurface drains function essentially like a line of extraction wells and therefore can perform many of the same functions as wells. Use of subsurface drains is generally limited to shallow depths.

Treatment Technologies

Potential groundwater treatment can be accomplished either on site or off site using one of the following four general approaches:

- On-site treatment using mobile treatment systems;
- On-site construction and operation of treatment systems;
- Pretreatment followed by discharge to a publicly owned treatment works (POTW) facility; and
- Transportation of waste to an off-site treatment facility.

Treatment processes that may be incorporated into any of these approaches include the following.

Biological Treatment

All biological treatment systems are designed to expose wastewater containing biologically degradable organic compounds to a suitable mixture of microorganisms in a controlled environment that contains sufficient essential nutrients for the biological reaction to proceed. Under these conditions, the reduction of biologically assimilable pollutants will take place in a reasonably predictable manner. Biological treatment is based on the ability of microorganisms to utilize organic carbon as a food source or to otherwise break down or transform the contaminants through the catalyzing action of its enzymes. The treatment is classified as either aerobic, anaerobic, or facultative. Aerobic treatment requires the availability of free dissolved oxygen for the biooxidation of the waste. Anaerobic treatment is intolerant of free dissolved oxygen and utilizes "chemically bound" oxygen (such as sulfates), and energy inherently present in the organic substances, in breaking down the organic material. Facultative organisms can function under aerobic or anaerobic conditions as the oxygen availability dictates.

Biological treatment processes are widely used and, if properly designed and operated, capable of achieving high efficiency at removing organic substances. Such systems are given sufficient reaction time so that they can reduce the concentration of any degradable organic material to a very low concentration. Typically, biological treatment systems employ activated sludge, sequencing batch reactors, aerobic or anaerobic fluidized bed systems, rotating biological contactor (RBC) systems, fixed-film bioreactors, or aerated lagoons, etc.

A great deal of research and development has focused on using methanotrophic bacteria that require the addition of oxygen and methane to break down chlorinated organics such as trichloroethene. While this technology is still under development, a principal impediment to using this technique for treatment of chlorinated organics is the fact that contaminant removal by stripping occurs at levels comparable to rates of biodegradation, indicating that direct air-stripping would be more effective in treating extracted groundwater. Other work has focused on the use of cosubstrates other than methane (e.g., phenol), although this work is still in the developmental stage.

Physical/Chemical Treatment

Physical and chemical treatment processes potentially applicable for remediation of the contaminated groundwater at the Abandoned Solvent Center site include the following:

- **Carbon Adsorption** is used to remove dissolved organic compounds from groundwater. The process has been demonstrated as an effective and reliable means of removing low-solubility organic substances over a broad concentration range. Carbon adsorption can be designed for either column or batch applications, but groundwater treatment is typically performed utilizing columns. In column applications, adsorption involves the passage of contaminated water through a bed of activated carbon that adsorbs the contaminants into the carbon. When the activated carbon has been utilized to its maximum adsorptive capacity (i.e., spent), it is then removed for disposal, destruction, or regeneration.

- **Air Stripping** is a mass-transfer process in which volatile organic contaminants are transferred to the air stream by pumping the contaminated groundwater through a packed air-stripping tower. The organic-laden air stream from the tower is then typically treated using carbon adsorption. Air stripping, using packed towers, is a well-established, effective remedial technology for the removal of VOCs from groundwater.

- **UV/Ozonation** uses a combination of UV and ozone to chemically oxidize organic compounds present in water. Complex organic molecules are broken down into a series of less-complex molecules. The end products are water, carbon dioxide, and hydrogen chloride. As part of the EPA's Superfund Innovative Technology Evaluation (SITE) program, UV/ozonation was demonstrated as an effective method for treatment of groundwater containing chlorinated organic compounds (EPA 1990).

- **Filtration** is a physical process that removes suspended solids (and any associated contaminants) from solution by forcing the fluid through a filtering medium. The filtering medium may be a fibrous fabric (paper or cloth), a screen, or a bed of granular material. Fluid flow through the filtering medium may be accomplished by gravity, by inducing a partial vacuum on one side of the medium, or by exerting a mechanical pressure on a dewatered sludge enclosed by a filtering media. Filtration may be employed to remove undissolved metals present as suspended solids. Filtration could also be used as a pretreatment for air stripping, carbon adsorption, or ion exchange to reduce the potential for clogging or overloading of these processes.

- **Precipitation/Coagulation/Flocculation** is a process used primarily to treat aqueous wastes containing metals. Precipitation is a chemical (or electrochemical) process that converts soluble metallic ions and certain anions to an insoluble form for subsequent removal from the wastewater stream. Various coagulants and coagulant aids such as alum, ferric chloride, sodium sulfide, organic polymers, and sodium hydroxide are selected, depending on the specific waste material to be removed, and rapidly mixed with the wastewater to cause the colloidal particles to agglomerate into a floc large enough to be removed by a subsequent clarification process. The performance of the process is affected by chemical interactions, temperature, pH, solubility variances, and mixing effects.

Disposal

Three technologies were identified for groundwater disposal: transport to a POTW for final disposal, reinjection to groundwater, and surface water discharge.

- **Publicly Owned Treatment Works.** Contaminated groundwater from the site may be pretreated on site and then transported to a nearby POTW for final disposal.

- **Reinjection to Groundwater.** Treated groundwater may be reinjected into the aquifer from which it was withdrawn. This approach can be used to help direct the flow of contaminated groundwater toward the extraction wells or recovery trenches.

- **Surface Water Discharge.** Treated groundwater may be discharged to a nearby surface water body. A State Pollution Discharge Elimination System (SPDES) permit would be required for the discharge.

Institutional Controls

Institutional controls are measures designed to protect human health until remedial action goals are met. Such controls include deed restrictions, regulatory restrictions on the use and construction of water wells, and well advisories.

The No-Action Alternative

This action would not include any remedial or institutional actions, but may include a groundwater monitoring program.

3.3.3 Landfill Gas

Remedial technologies for landfill gas (LFG) are used to collect, remove, or treat gases generated by landfills. The technologies that were initially considered are discussed below.

LFG Collection

A proper landfill cover reduces odors and vertical migration of LFGs; however, it also increases the lateral migration of LFG and the potential of entrapping explosive gases in nearby structures. The lateral migration of LFG can be controlled by the use of permeable or impermeable systems. The permeable systems collect the LFG through a porous material and provide a conduit for it to reach the system. Impermeable systems prevent the flow of the LFG and also provide conduits to the surface to reduce pressure buildup.

LFG collection systems can be divided into two types--passive and active.

Passive Systems. Passive LFG systems alter the subsurface gas flow pathways without using mechanical means. Generally, a series of permeable interception systems divert gas flow to points of controlled release. Flow to outside areas is prevented by impermeable barriers. Passive systems are not designed to recover LFG; their use is to control the release of LFG to the atmosphere. Typical passive systems consist of pipe and/or trench vents. Pipe vents are used to vent LFG at a point where it is collecting and building up pressure. They are often used in conjunction flares that burn the gas at the point of release. Trench vents consist of trenches backfilled with a permeable material (gravel) constructed around the perimeter of the waste site. This forms a path of least resistance for the gas to flow upward to the atmosphere. A barrier system, such as a geosynthetic liner, can be added to the outside wall to increase the effectiveness of the trench.

Active Systems. Active systems control the migration of LFG through the use of mechanical means that alter pressure gradients to redirect subsurface gas flows. Major system components typically include extraction wells, collection headers, vacuum blowers or compressors, and treatment or use systems. Active systems are typically used to prevent migration, control odor problems, or where required by land use.

The most common type of active system is the on-site extraction well system. It consists of a series of wells in the landfill, typically 100 to 300 feet apart. The wells are then connected by a header pipe that is placed under negative pressure by using vacuum blowers. The pressure differential draws the LFG upward through the extraction wells and through a free vent or waste-gas burner. Enclosed flares have been proven to be effective at eliminating odors by destroying the combustible components of the LFG.

Thermal Treatment

The most common technology used for treatment of LFG at CERCLA sites is thermal destruction using enclosed ground flares. Treatment of LFG is necessary when air emission standards are violated, an odor problem exists, or when future use includes allowing public access.

Enclosed ground flare systems consist of two major components, a refractory-lined flame enclosure (stack) and a burner assembly at the base. The LFG is fed through an open-ended pipe where it is ignited by pilot burners. A supplemental fuel is combined with the LFG, if needed, to support combustion (i.e., methane concentration less than 30%).

Institutional Controls

Institutional controls are measures designed to protect human health and limit the exposure potential to LFG. Institutional controls can include deed restrictions and regulatory restrictions on construction.

The No-Action Alternative

The no-action alternative may include some type of LFG monitoring but would not include any type of institutional or remedial actions.

Table 3-1

POTENTIAL GROUNDWATER ARARs FOR CONTAMINANTS OF CONCERN

Parameter	NYSDEC Class GA Water Quality Standards (μg/L)	Safe Drinking Water Act Primary Maximum Contaminant Levels (μg/L)	Safe Drinking Water Act Secondary Maximum Contaminant Levels (μg/L)
1,1-Dichloroethane	5	--	--
1,1-Dichloroethene	5	7	--
Total 1,2-Dichloroethene	5	--	--
Trichloroethene	5	5	--
Toluene	5	--	40[a]
Vinyl chloride	2	--	--

[a] Proposed value.

Source: Ecology and Environment Engineering, P.C. 1992.

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Table 3-2

SUMMARY OF GENERAL RESPONSE ACTIONS

Contaminated Media	Contamination Concern	General Response Action
Soil	Surface, subsurface, and air contamination (contaminated dust particles)	Containment Partial or Complete Removal On- or off-site disposal On- or off-site treatment *In situ* treatment Institutional actions No action
Groundwater	On-site groundwater contamination; potential off-site groundwater contaminant migration affecting water quality in nearby residential wells used for domestic purposes and nearby surface water.	Containment Extraction On- or off-site treatment *In situ* treatment Disposal Institutional actions No action
Landfill Gas	Gases produce odors and may be migrating off site causing an explosion hazard. Capping of landfill will increase off-site migration rates.	Collection Treatment Institutional controls No action

Source: Ecology and Environment Engineering, P.C. 1992.

Table 3-3

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

General Response Action	Applicable Remedial Technology
Soil	
Containment	Capping
Excavation (Hot Spots)	Excavation
On- or off-site disposal	On-site landfill Off-site landfill
On- or off-site treatment	Thermal treatment Infrared incineration Rotary kiln incineration Physical treatment Solidification/stabilization Low-temperature Thermal Desorption Biological Treatment
In situ treatment	Vacuum extraction Solidification/stabilization Vitrification
Institutional actions	Fencing Deed restrictions
No action	Monitoring
Groundwater	
Subsurface Barriers	Slurry walls Grouting Sheet piling
Groundwater extraction	Pumping Subsurface drains
On- or off-site treatment (for groundwater, seepage, process water, decontamination water)	Biological Treatment Physical/Chemical Treatment Activated carbon adsorption Air stripping UV/ozonation Filtration Ion exchange Precipitation/coagulation/flocculation
In situ treatment	Bioremediation
Groundwater disposal	POTW Reinjection to groundwater Surface water discharge

Table 3-3

SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

General Response Action	Applicable Remedial Technology
Institutional controls	Deed restrictions Regulatory restrictions Well-use advisories
No action	Monitoring
Landfill Gas	
Collection	Passive Active
Treatment	Activated carbon adsorption Thermal destruction
Institutional controls	Deed restrictions Regulatory requirements
No-Action	Monitoring

Source: Ecology and Environment Engineering, P.C. 1992.

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Capping and Grading				
	Capping would effectively reduce surface water infiltration and minimize any direct-contact hazards. Would require long-term maintenance.	Easily implemented. Restrictions on future land use.	Yes	Minimal requirement by 6 NYCRR Part 360.2
Excavation (Hot Spots)				
	Excavation is a well-demonstrated and reliable technology for removal of contaminated soils.	Relatively simple to implement. May require groundwater dewatering techniques as well as dust/vapor control measures.	Yes	For use in dealing with consolidation of wastes and hot spots which may be identified in the future.
On-Site Disposal				
	Will reduce areal extent of landfill area and eliminate the need to transport investigation wastes (cuttings, clothing, trench spoils).	An acceptable means for dealing with investigation wastes and consolidated material.	Yes	Retain for future use (i.e., consolidation and investigation wastes).
Off-Site Disposal				
	Disposal in a commercial facility would be protective of human health and the environment.	Would require securement of a disposal facility capable of accepting the soil. RCRA treatment standards codified in 40 CFR Part 268 must be met prior to disposal. Transportation of soil required.	Yes	Retain for use in consolidation of wastes. If a high hazard waste is located technology may be appropriate.

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Thermal Treatment				
	Well-demonstrated as a reliable and effective method for treating waste and soils with organic contaminants. Ineffective for treatment of metals.	On-site fixed and mobile incinerators are widely available commercially. Permitting for an on-site incineration system may be time-consuming and difficult. Most incineration systems require 1 to 2 acres for set-up of the incinerator and ancillary equipment. Establishment of water and electrical utilities would be required for the implementation of on-site incineration. For off-site incineration, only a limited number of commercial incineration facilities have the RCRA and TSCA permits necessary to accept the waste material from the site. These facilities are more than 500 miles from the site.	No	The large volume of the landfill is prohibitive. Waste also contains metals (iron, aluminum, lead) that would become concentrated if treated thermally.

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Physical Treatment				
Soil washing	Soil washing has been successfully demonstrated to clean a wide range of organic and inorganic contaminants from the course fraction of soil (i.e., sand and gravel). Soil washing has great difficulty removing contaminants from the fine fraction of soil (silt, clay, and soil organic matter), where most of the contaminants tend to be concentrated. Therefore, soil washing is primarily used as a volume-reduction technique, separating the course soil fraction from the fine soil fractions. Soil washing produces a sludge consisting of the fine soil fractions, and this sludge requires further treatment (e.g., incineration). The higher the percentage of fines in the feed soil, the more sludge that would be produced by the soil washing process. Typically, the fines should not exceed 25% to 35% of the total soil composition in order to achieve an economical volume reduction. (Soil particle size distribution results were not available at the time of this report.)	Soil washing systems are available through a number of commercial vendors. A treatability study would be required prior to implementation. Soil washing would be inappropriate due to the percent of fines in the soils as well as the large volume of the landfill waste.	No	--

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Physical Treatment (Cont.)				
Solidification/stabilization	Well-demonstrated as an effective remedial method for metals contamination, although no metals were determined to be a contaminant of potential concern based on the Phase I RI data. The long-term reliability of this technology is not known. May have limited or no effectiveness on VOCs, the primary class of potential contaminants of concern at the Wellsville Landfill site. Treatability testing would be required.	Effectiveness for VOCs is questionable. Would require prescreening because of waste materials. Process also results in increased volume (10% to 100%) which would be unacceptable for a landfill of this size.	No	--
Low-temperature thermal desorption	Low-temperature thermal desorption systems are designed to separate volatile organic contaminants from solids or sludges with relatively low organic concentrations, typically less than 10%. Treatability testing of volatile and semivolatile organic contaminants using this technology indicates greater than 97% removal efficiency (The Hazardous Waste Consultant, 1990). Treatability testing would be required to determine the actual effectiveness for the contaminated soils at the site.	This technology is commercially available through a number of vendors. Treatability testing would be required. Air emission must comply with applicable state and federal air quality regulations.	No	--
Critical fluid extraction	This emerging technology is potentially applicable for treatment of organic wastes; however, it appears to be best suited for aqueous wastes. Extraction of soils presents materials handing problems.	Commercial availability is limited.	No	--

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Physical Treatment (Cont.)				
Chemical extraction	Chemical extraction has had limited application in treatment of hazardous wastes. It has been proven effective in removing PAHs and PCBs from oily soils and sludges.	Has not been proven effective on VOCs, which are the contaminants of concern at the site.	No	--
Biological Treatment				
	Effectiveness for chlorinated VOCs (e.g., TCE and VC) is not well- demonstrated for remediation of soil. Biological treatment has, with a few exceptions, been applied to chlorinated organic contamination problems on only a pilot or developmental scale. Furthermore, the aerobic techniques under development require thorough aeration, and for some systems, the addition of methane. This procedure results in the removal of a significant fraction of chlorinated organics through volatilization, indicating that volatilization would be a more effective remedial technique than biodegradation.	Implementability is not considered because the technology is not well-demonstrated for the contaminants of primary concern at the site (chlorinated aliphatic hydrocarbons).	No	--

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
***In Situ* Treatment**				
Soil flushing	The effectiveness of soil flushing may be limited by the hydrogeology of the site. The relatively low permeability of the overburden would limit the potential for the flushing solution to come in contact with and subsequently solubilize the soil contaminants. Moreover, the complex mixture of contaminants would make it difficult to formulate a single washing solution that will consistently and reliably remove all the different types of organic contaminants.	Technically, no barriers exist to implementing a soil-flushing system. A SPDES permit would be required to inject the elutriate into the ground. Due to the questionable effectiveness of this technology for remediation of the contaminated soil, including the possibility of further migration of the contaminants, such a permit may not be issued.	No	High potential to increase off-site contamination of groundwater during flushing.
Bioremediation	The effectiveness of this technology for remediation of soil containing chlorinated aliphatic hydrocarbons (the class of contaminants of primary concern) is not well-demonstrated.	This technology would not be expected to effectively remediate the contaminated soil.	No	-- ?
Vacuum extraction	Well-demonstrated as a reliable and effective method for remediation of VOCs. Ineffective for metals and PCBs and severely limited in its effectiveness for semivolatile organic compounds. Treatability testing prior to full-scale implementation would be recommended to confirm the effectiveness of this soil treatment for the Abandoned Solvent Center site. ?	This process is commercially available. Treatability testing would be required. Air emissions must comply with applicable state and federal air quality regulations.	Yes	Retained for possible further hot spots. May be limited by cell construction (non-continuous).

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
In Situ Treatment (Cont.)				
Solidification/stabilization	Complete and uniform mixing of the solidifying agent with in-place materials is often difficult. May have limited or no effectiveness on VOCs. Long-term reliability of this technology is not known, especially if portions of the solidified mass are in the saturated zone, as could be the case at the Wellsville Landfill site. Treatability testing would be required.	This technology is commercially available through numerous vendors.	No	--
Vitrification	Vitrification would destroy the organic contaminants by pyrolysis, and the metal contaminants would either vaporize or be incorporated into a chemically inert, stable glass residual product. Off gases from the system require collection and subsequent treatment. In situ vitrification off-gas processing equipment has limits relative to the amount of heat load and volume of gases it can process. These limits are associated with the concentrations of organics and other gas-generating materials that can be treated. Generally, the organic concentration limit is 5% to 10%.	This process is commercially available. Treatability testing would be recommended prior to implementation. Air emissions must comply with applicable state and federal air quality regulations.	Yes	? Preliminarily retain this technology until the Phase II RI data are assessed. Soil TOC data would be necessary to assess the off-gas treatment system's capabilities. Possible application as vertical barrier.
Institutional Controls				
Fencing and/or deed restrictions	May be effective in reducing the potential for exposure to contaminated soils and limit impact of trespassers on final cover. Does not reduce contamination.	Implementability would be dependent upon legal requirements and authority.	Yes	--

Table 3-4

CONTAMINATED SOIL TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
No Action				
Monitoring	Does not achieve remedial action objectives. Useful for documenting conditions; does not reduce risk.	Monitoring alone would not be acceptable to the public, local government, or NYSDEC.	Yes	--

Source: Ecology and Environment Engineering, P.C. 1992.

Table 3-5

GROUNDWATER TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Subsurface barriers				
	An evaluation of the effectiveness of a subsurface barrier for groundwater containment at the Wellsville Landfill site requires additional data regarding groundwater contaminant migration.	Implementability of this technology will depend upon the assessment of groundwater contaminant migration to be made after the completion of Phase II RI field work. Factors to be considered include (but are not limited to): depth of groundwater contamination (i.e., is the fractured bedrock beneath the site contaminated?) and the extent to which the dense soil zone (approximately 20 feet below ground surface) acts as a confining soil zone. Installation of subsurface barriers would require restrictions on future land use.	Yes	Preliminarily retain this technology until the Phase II RI data are assessed.
Groundwater Extraction				
Pumping	Groundwater pumping can serve the dual purpose of active restoration and containment. As with subsurface barriers, an evaluation of the effectiveness of groundwater pumping requires additional groundwater contaminant migration information.	Readily implementable. Extracted groundwater may require treatment and subsequent disposal. Institutional controls would be required and would remain in place until restoration was completed.	Yes	--
Subsurface drainage	The evaluation and design of an effective subsurface drain system to intercept or contain the contaminated groundwater plume requires further information regarding groundwater contaminant migration pathways.	Implementability of subsurface drains depends upon groundwater contaminant migration pathways.	Yes	Preliminarily retain subsurface drains until Phase II RI data are assessed.

Table 3-5

GROUNDWATER TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Biological treatment				
	Effectiveness for chlorinated VOCs is not well-demonstrated and still under development.	Existing leachate collection system is utilizing village POTW for biological treatment. Long-term on-site treatment is under consideration.	Yes	--
Physical/Chemical Treatment				
Activated carbon adsorption	Carbon adsorption has been well-demonstrated as an effective and reliable means of removing low-solubility organics over a broad concentration range.	This is a conventional treatment method that is easily implemented. Carbon adsorption isotherm testing would be recommended prior to implementation to estimate carbon usage. Spent carbon would require treatment.	Yes	--
Air stripping	Well-established technology for removal of VOCs found in the groundwater. Iron concentrations in the groundwater may require pretreatment to prevent plugging or fouling of the tower. Air stripping transfers organic contaminants from the water phase into the air phase. Treatment of the air phase (e.g., carbon adsorption) would be required to remove the organic contaminants.	This is a conventional treatment technique that is commercially available. Permitting would be required for air emissions.	Yes	--

Table 3-5

GROUNDWATER TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Physical/Chemical Treatment (Cont.)				
UV/ozonation	Relatively new technology for treatment (through oxidization) of organic contaminants in groundwater. However, it has been noted that organic compounds with single bonds such as 1,1,1-TCA are relatively difficult to oxidize. Iron pretreatment would be required. Can be operated in either batch or continuous mode. A bench scale treatability study would be recommended prior to implementation.	UV/ozonation treatment systems are readily available through commercial vendors. Permitting would be required for air emissions.	Yes	--
Filtration	Filtration is a reliable and effective means of removing low levels of suspended solids from wastewater.	Filtration equipment is relatively simple, readily available in a wide range of sizes, and easy to operate and control.	Yes	--
Ion exchange	Demonstrated as an effective method for removal of ionic metal species from water. Solid concentrations greater than 50 mg/L should be avoided to prevent fouling and plugging of the resin bed. Spent ion exchange resins require further treatment and/or disposal.	Easily implementable and widely available.	Yes	--
Precipitation/coagulation/flocculation	Well-demonstrated as an effective treatment for removal of dissolved and suspended solids from water. Bench-scale treatability testing would be required to determine design parameters such as required chemical dosages, degree of precipitation, reaction times, and sludge production and settling rates.	Readily implementable.	Yes	--

Table 3-5

GROUNDWATER TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
In Situ Treatment				
Bioremediation	Effectiveness for chlorinated VOCs not well demonstrated. Potentially complex nature of the hydrology and contaminant plume migration pathways as well as the relatively low hydraulic conductivity of the overburden aquifer could severely limit the effectiveness of any in situ treatment.	Implementability is not considered because the technology is not well-demonstrated for chlorinated VOCs.	No	--
Groundwater Disposal				
POTW	Effectiveness and reliability dependent upon treatment system and capacity of POTW.	Presently being implemented for leachate, additional capacity is questionable.	Yes	--
Reinjection to groundwater	Reinjection will effectively dispose of groundwater as long as injection point is part of overall remedial design.	Reinjection requires a SPDES permit, which may be difficult to obtain due to the potentially complex hydrogeology and groundwater contaminant migration pathways.	Yes	--
Surface water discharge	Treated groundwater discharged to surface water will effectively dispose of groundwater.	Groundwater discharge to surface water body would require treatment and monitoring in accordance with a SPDES permit.	Yes	--
Institutional controls				
	Institutional controls will not restore water quality but may minimize or prevent exposure to contaminated groundwater.	Implementability would be dependent upon legal requirements and authority.	Yes	--

Table 3-5

GROUNDWATER TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
No Action				
Monitoring	Useful for documenting conditions. Does not reduce contamination.	Monitoring alone would not be acceptable to the public, local government, or NYSDEC.	Yes	--

Source: Ecology and Environment Engineering, P.C. 1992.

Table 3-6

LANDFILL GAS TECHNOLOGY SCREENING

Remedial Technology	Effectiveness	Implementability	Retain Action	Screening Comment
Collection/Containment				
Passive Collection	Using permeable interception systems and impermeable barriers, subsurface gas flow is directed to controlled release points. Effectively reduces off-site migration and uncontrolled releases.	Technology is simple and readily available. Systems are designed specifically for site conditions. A gas venting layer is a minimal requirement by 6 NYCRR Part 360.2 as part of a final cover system.	Yes	--
Active Collection	Uses mechanical means to alter the subsurface pressure gradients, thereby controlling flow paths. An effective means for controlling and recovering energy from landfill gases.	Technology is readily available and adaptable to site conditions. Requires energy source for vacuum blowers/compressors.	Yes	May be required based on future uses of site.
Thermal Treatment				
Enclosed Ground Flaring	Uses a flame to burn off combustible organic compounds. Effectiveness is dependent on landfill gas quality and retention time. No performance standards exist other than for emission controls. Reportedly effective up to 99%.	Technology is available from several vendors or can be custom designed. Can be run from central location(s) connected by header pipes to increase efficiency. System may require a supplemental fuel supply depending on landfill gas quality (i.e., >30% methane). Must comply with current emission standards including CAA Title III (Toxics).	Yes	--
Institutional Controls				
	Institutional controls will not reduce odors or off-site migration but may minimize potential for exposure and explosive hazard	Not appropriate as 6 NYCRR, Part 360 requires a gas venting system to be included with the required final cover system.	No	--
No-Action				
Monitoring	Useful for documenting changing conditions. Does not reduce or eliminate emissions or migration.	Monitoring in itself is not acceptable to NYS. It is less than that required by current regulations.	Yes	--

Source: Ecology and Environment Engineering, P.C. 1992.

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Table 3-7

REMEDIAL TECHNOLOGIES RETAINED FOR FURTHER EVALUATION

Contaminated Soil
Capping
Excavation (hot spots)
On-site disposal
Off-site disposal
In situ treatment Vacuum extraction Vitrification
Institution controls
No action (monitoring)
Groundwater
Subsurface barriers
Groundwater extraction Pumping Subsurface drains
Biological treatment
Physical/chemical treatment Activated carbon adsorption Air stripping UV/ozonation Filtration Ion exchange Precipitation/coagulation/flocculation
Groundwater disposal POTW Reinjection to groundwater Surface water discharge
Institutional controls
No action (monitoring)
Landfill Gas
Collection Passive Active
Thermal Treatment
No-Action

Source: Ecology and Environment Engineering, P.C. 1992.

4. SCREENING OF TECHNOLOGIES

Remedial technology screening, based upon effectiveness and implementability, was conducted to refine the complete list of technologies presented in Table 3-3. The screening criteria used are discussed below:

- **Effectiveness.** This criterion addresses both the potential effectiveness of the technologies in handling the estimated areas or volumes of media and in meeting the remediation goals identified in the remedial action objectives, as well as the potential impacts to human health and the environment during the construction and implementation phase. Furthermore, it considers how proven and reliable the process is in remediating the contaminants of concern in soil/waste and groundwater.
- **Implementability.** This criterion encompasses both the technical and administrative feasibility of implementing a remedial technology.

The aforementioned criteria were used to eliminate those remedial technologies that are unproven, not applicable, or not expected to achieve an acceptable level of performance. The results of the screening are presented in Table 3-4 for contaminated soil, in Table 3-5 for groundwater, and Table 3-6 for LFG. A list of the technologies that were retained from the initial or preliminary screening of applicable remedial technologies is presented in Table 3-7. These retained technologies will be further screened and combined into remedial alternatives in Section 5 (Development of Remedial Alternatives).

5. DEVELOPMENT OF REMEDIAL ALTERNATIVES

The development of alternatives requires completion of the following tasks:

- Identification of remedial action objectives;
- Identification of potential treatment, resource recovery, and containment technologies that will satisfy the remedial action objectives;
- Screening the technologies based on their effectiveness and implementability; and
- Assembling technologies retained for further evaluation to form remedial alternatives.

The aforementioned tasks were completed in Section 2 to the extent possible. However, because of the following identified data gaps, remedial alternatives for the Wellsville-Andover Landfill site cannot adequately be developed at this time.

- **Extent of leachate generation is unknown.** No data exists as to the volume and rate of flow of groundwater within and adjacent to the fill areas. The amount of "clean" groundwater that flows into the leachate collection system is also unknown. This information is necessary to determine if any groundwater diversion/barrier systems are appropriate (e.g., the identification of an isolated pathway). Additionally, the volume and flow rates are needed to evaluate the need for and, if required, to size and develop a groundwater treatment system.
- **Local groundwater hydrology is not clearly defined.** The initial hydrogeological results from the Phase I RI indicate that there may possibly be a shallow, fractured bedrock ridge located beneath the eastern half of the south-central and south fill areas. This is evident by the apparent reversal of groundwater flow from northeast-southwest to northwest-southeast based on the contaminant levels of monitoring wells 2d, 5d, 5S, and 11S. The locations of the Ladue and Mill springs to the southeast of the landfill would also indicate shallow groundwater flow in this area. If such a fracture does exist, it would be an isolated area of groundwater flow through the fill areas. If this is true, the possibility for relocating the waste out of the area of influence should be considered.

- **Quality and treatability of groundwater and leachate is not well defined.** Accurate data on the current quality and treatability of the groundwater and leachate are needed to evaluate the impact of the leachate on the groundwater and surface water and to identify which treatment technologies are best suited for the site, if required. This data should include both conventional (pH, TSS, TKN, BOD/COD, etc.) and non-conventional (toxins) pollutants. The Phase I RI provided one round of samples for non-conventional pollutants. However, this was from only one particular flow incident. In order to establish a true average or range of contamination concentrations, additional flow incidents should be included.

  The only conventional pollution data located was the RCRA Research, Inc. leachate analysis from 1979. The characteristics of the leachate will probably have changed since then due to the years of leaching action. Therefore, current conventional pollution data should be collected for both the high level (leachate) and low level (groundwater) contamination present at the site. This information should be collected during several flow incidents to determine a range of concentrations as stated above.

- **Verification of waste locations.** The results of the ground conductivity survey from the Phase I RI need to be field verified. This is necessary to determine the areal extent of the final cover system, which is required by 6NYCRR Part 360 and RCRA. The field verification will help in determining the exact location of the waste perimeter and ultimately the termination point of the landfill cover.

- **Available landfill emission data is not based on soil gas surveys.** The air sampling performed during the Phase I RI identified several VOCs at elevated levels (i.e., benzene, TCE, and VC). However, as these samples were collected from the manholes and risers of the LCS they may not be representative of the gases that are permeating to the surface of the landfill. A soil gas survey should be performed to determine the soil gas contaminant concentrations and locate potential gas generation "hot spots." This information will be required to determine the disposal/treatment technologies suitable for the landfill.

Remedial alternatives will be developed after completion of the Phase II RI and Human Health Risk Assessment, and consistent with the NCP (40 CFR 300.430) the following range of alternatives will be developed (as practicable):

- The no-action alternative;

- Alternatives that remove or destroy the contaminants of concern to the maximum extent possible, thereby eliminating or minimizing the need for long-term management;

- Alternatives that treat the principal contamination concerns but vary in the degree of treatment employed and long-term management needed; and

- Alternatives that involve little or no treatment but provide protection of human health and the environment by preventing or minimizing exposure to contaminants through the use of containment options and/or institutional actions.

APPENDIX A

POTENTIAL FEDERAL ARARs
LOCATION SPECIFIC AND ACTION SPECIFIC

(From: Conducting Remedial Investigations/Feasibility Studies
for CERCLA Municipal Landfill Sites, EPA 1991)

Table 5-2
POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs AT MUNICIPAL LANDFILL SITES

Page 1 of 2

Location		Requirement	Prerequisite(s)	Citation	Comments
1.	Within 61 meters (200 feet) of a fault displaced in Holocene time	New treatment, storage, or disposal of hazardous waste prohibited.	RCRA hazardous waste; PCB treatment, storage, or disposal.	40 CFR 264.18(a)	Counties considered seismically active listed in 40 CFR 264 Appendix VI.
2.	Within 100-year floodplain	Facility must be designed, constructed, operated, and maintained to avoid washout.	RCRA hazardous waste; PCB treatment, storage, or disposal.	40 CFR 264.18(b); 40 CFR 761.75	Applicable if part of the landfill is in the 100-year floodplain.
3.	Within floodplain	Action to avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values of the floodplain.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	Executive Order 11988, Protection of Floodplains, (40 CFR 6, Appendix A)	Applicable if part of the landfill is in the 100-year floodplain.
4.	Within salt dome formation, underground mine, or cave	Placement of noncontainerized or bulk liquid hazardous waste prohibited.	RCRA hazardous waste; placement.	40 CFR 264.18(c)	Need to verify that the site does not contain any salt dome formations, underground mines, or caves used for waste disposal.
5.	Critical habitat upon which endangered species or threatened species depends	Action to conserve endangered species or threatened species, including consultation with the Department of the Interior.	Determination of endangered species or threatened species.	Endangered Species Act of 1973 (16 USC 1531 et seq.); 50 CFR Part 200, 50 CFR Part 402	Need to identify whether any endangered species are known to exist on the site. May apply in rural areas.
6.	Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Executive Order 11990 Section 7.	Executive Order 11990, Protection of Wetlands, (40 CFR 6, Appendix A)	Applicable if wetlands are present next to or on the site.
		Action to prohibit discharge of dredged or fill material into wetland without permit.		Clean Water Act Section 404; 40 CFR Parts 230, 231	
7.	Wilderness area	Area must be administered in such a manner as will leave it unimpaired as wilderness and to preserve its wilderness character.	Federally owned area designated as wilderness area.	Wilderness Act (16 USC 1131 et seq.); 50 CFR 35.1 et seq.	Need to verify that the site is not within a Federal Wilderness Area.
8.	Wildlife refuge	Only actions allowed under the provisions of 16 USC Section 668 dd(c) may be undertaken in areas that are part of the National Wildlife Refuge System.	Area designated as part of National Wildlife Refuge System.	16 USC 668 dd et seq.; 50 CFR Part 27	Need to verify that the site is not within a National Wildlife Refuge.

Table 5-2
POTENTIAL FEDERAL LOCATION-SPECIFIC ARARs AT MUNICIPAL LANDFILL SITES

Page 2 of 2

Location		Requirement	Prerequisite(s)	Citation	Comments
9.	Area affecting stream or river	Action to protect fish or wildlife.	Diversion, channeling, or other activity that modifies a stream or river and affects fish or wildlife.	Fish and Wildlife Coordination Act (16 USC 661 et seq.); 40 CFR 6.302	The Fish and Wildlife Coordination Act requires consultation with the Department of Fish and Wildlife prior to any action that would alter a body of water of the United States.
10.	Within area affecting national wild, scenic, or recreational river	Avoid taking or assisting in action that will have direct adverse effect on scenic river.	Activities that affect or may affect any of the rivers specified in Section 1276(a).	Scenic Rivers Act (16 USC 1271 et seq. Section 7(a); 40 CFR 6.302(e)	Need to verify that national wild or scenic rivers are not located on the site and will not be affected by site remediation.
11.	Within coastal zone	Conduct activities in manner consistent with approved state management programs.	Activities affecting the coastal zone including lands thereunder and adjacent shorelands.	Coastal Zone Management Act (16 USC Section 1451 et seq.)	Applicable if the site has direct access to coastal areas.
12.	Oceans or waters of the United States	Action to dispose of dredge and fill material into ocean waters is prohibited without a permit.	Oceans and waters of the United States.	Clean Water Act Section 404, 40 CFR 125 Subpart M; Marine Protection Resources and Sanctuary Act Section 103	Applicable if disposal of dredge and fill material in ocean waters is planned.
13.	Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts.	Alteratin of terrain that threatens significant scientific, prehistorical, historical, or archaeological data.	National Archaeological and Historical Preservation Act (16 USC Section 469); 36 CFR Part 65	Should scientific, prehistorical, or historical artifacts be found at the site, this will become applicable.
14.	Historic project owned or controlled by federal agency	Action to preserve historic properties; planning of action to minimize harm to National Historic Landmarks.	Property included in or eligible for the National Register of Historic Places.	National Historic Preservation Act Section 106 (16 USC 470 et seq.); 36 CFR Part 800	Need to identify whether the site is included in the National Register of Historic Places.

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Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Air Stripping	Design system to provide odor-free operation.		CAA Section 101[a]	Odor regulations are intended to limit nuisance conditions from air pollution emissions.
	File an Air Pollution Emission Notice (APEN) with the State to include estimation of emission rates for each pollutant expected.		40 CFR 52[a]	State will have particular interest in emissions for compounds on their hazardous, toxic, or odorous list. Preliminary meeting with state prior to filing APEN is recommended in the regulation. Meeting would identify additional issues of concern to the State.
	Include with filed APEN the following: • Modeled impact analysis of source emissions. • Provide a Best Available Control Technology (BACT) review for the source operation.	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52[a]	State may identify further requirements for permit issuance after first review. These provisions follow the federal Prevention of Significant Deterioration (PSD) framework with some modifications. Additional requirements could include ambient monitoring and emission control equipment design revisions to match Lowest Achievable Emission Requirements (LAER). While a permit is not required for an onsite CERCLA action, the substantive requirements identified during the permitting process are applicable.
	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[a]	The control technology review for this regulation (RACT) could coincide with the BACT review suggested under the PSD program.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CFR 61[b]	
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[a]	Regulation 8 indicates any source emitting the regulated compounds is subject to this regulation. However, some of the specific regulations further restrict the scope of applicability.
Capping	Placement of a cap over hazardous waste (e.g., closing a landfill, or closing a surface impoundment or waste pile as a landfill, or similar action) requires a cover designed and constructed to: • Provide long-term minimization of infiltration of liquids through the capped area. • Function with minimum maintenance. • Promote drainage and minimize erosion or abrasion of the cover. • Accommodate settling and subsidence so that the cover's integrity is maintained. • Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	RCRA waste in landfill. Significant management (treatment, storage, or disposal) of hazardous waste will make requirements applicable; capping without disturbance will not make requirements applicable, but technical requirements may be relevant and appropriate.	40 CFR 264.228(a) (Surface Impoundments) 40 CFR 264.258(b) (Waste Piles) 40 CFR 264.310(a) (Landfills)	RCRA capping requirements could be relevant and appropriate to capping hazardous wastes in place. RCRA is generally considered relevant if it can be verified, through review of records, interviews, or other means, that the landfill accepted RCRA wastes after November 19, 1980. The appropriateness of RCRA requirements is based also on each requirement's technical merit in a given situation. If a groundwater containment problem exists, a RCRA cap would serve to isolate and contain landfill solids and contaminated soils and limit infiltration of precipitation. EPA guidance on RCRA caps for new RCRA landfill cells includes multibarrier caps of clay and liners. Excavation and reconsolidation of the wastes onsite, in a location outside of the current area of contamination, would make these requirements, as well as the landfill construction and operation requirements applicable for wastes that can be designated as hazardous. If the wastes are excavated and reconsolidated in their current location, the capping requirements are applicable. The major determining factors are the location of the final disposal, and the classification of the waste materials.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
	Eliminate free liquids, stabilize wastes before capping (surface impoundments).		40 CFR 264.228(a)	
	Restrict post-closure use of property as necessary to prevent damage to the cover.		40 CFR 264.117(c)	
	Prevent run-on and run-off from damaging cover.		40 CFR 264.228(b) 40 CFR 264.310(b)	
	Protect and maintain surveyed benchmarks used to locate waste cells (landfills, waste piles).		40 CFR 264.310(b)	
	Disposal or decontamination of equipment, structures, and soils.		40 CFR 264.111	
Closure with Waste in Place (Capping)	Eliminate free liquids by removal or solidication.		40 CFR 264.228(a)(2)	See discussion under Capping.
	Stabilization of remaining waste and waste residues to support cover.		40 CFR 264.228(a)(2) and 40 CFR 264.258(b)	
	Installation of final cover to provide long-term minimization of infiltration.		40 CFR 264.310	
	Post-closure care and groundwater monitoring.		40 CFR 264.310	
Clean Closure (Removal)	General performance standard requires minimization of need for further maintenance and control; minimization or eliminatin of post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products.	Disturbance of RCRA hazardous waste (listed or characteristic) and movement outside the unit or area of contamination. May apply to surface impoundment or to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation and returned to land.	40 CFR 264.111	Clean closure removal of contaminated materials does not appear to be feasible for most municipal landfill sites because of the large volume of wastes. However, clean closure removal may be considered for portions of the site, such as hot spot areas. The RCRA clean closure requirements would be considered relevant and appropriate to contaminated wastes which are not hazardous, but which are similar to hazardous wastes.
	Disposal or decontamination of equipment, structures, and soils.		40 CFR 264.111 and 268	The RCRA Land Disposal Restrictions require treatment of RCRA wastes to specified levels or by specified technologies. The RCRA requirements would be considered relevant and appropriate to wastes that are not RCRA hazardous wastes, but which are similar (same constituents) as RCRA wastes. RCRA Land Disposal Restrictions require treatment of RCRA wastes to specified levels or by specified technologies before land disposal. If treatment to the specified level or by the specified technology is not achievable or appropriate, a variance mu[illegible] obtained from the EPA. If the wastes are determined to be RCRA wastes, these requirements would be applicable.

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Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Clean Closure (Removal) (cont'd.)	Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste. Meet health-based levels at unit.	Not applicable to undisturbed material. Disposal of RCRA hazardous waste (listed or characteristic) after disturbance and movement outside the unit or area of contamination.	40 CFR 264.228(a)1) and 40 CFR 264.258	In the event that the wastes being removed are determined to be hazardous wastes, the requirements of this section would be applicable.
Consolidation	Area from which materials are removed should be remediated.	Disposal by disturbance of hazardous waste (listed or characteristic) and moving it outside unit or boundary of contaminated area.	See Closure	If nonhazardous wastes are excavated and moved outside the current area of contamination, these requirements will become relevant and appropriate. These regulations are intended to insure that when wastes are consolidated at a central location, the satellite areas (former locations of the wastes) are remediated. If the wastes which are excavated for consolidation are determined to be hazardous wastes, this regulation will be applicable.
	Consolidation in storage piles/storage tanks will trigger storage requirements.		See Container Storage, Tank Storage, Waste Piles in this table.	RCRA requirements for storage in containers, tanks, or piles will be relevant and appropriate for nonhazardous wastes which are similar to RCRA hazardous wastes, or for hazardous wastes disposed prior to Novemer 1980, which are excavated from the site and stored prior to consolidation and/or disposal. If excavated materials can be classified as hazardous wastes, the requirement will be applicable.
	Placement on or in land outside unit boundary or area of contamination will trigger land disposal requirements and restrictions.	After November 8, 1988.	40 CFR 286 (Subpart D)	Certain listed hazardous wastes are not eligible for disposal in landfills or other land-based facilities unless treated to RCRA specified criteria. The requirement may be relevant and appropriate to some nonhazardous wastes at municipal landfill sites which are contaminated with hazardous constituents at levels similar to those in listed wastes, and are excavated for reconsolidation and disposal outside the current area of contamination. If any of the wastes are determined to meet the definitions of the restricted hazardous wastes, the requirements will be applicable.
	Develop fugitive and odor emission control plan for this action if existing site plan is inadequate.		CAA Section 101^a and 40 CFR 52^a	Odor regulations are intended to limit nuisance conditions from air pollution emissions. Fugitive emission controls are one feature of the state implementation plan used to achieve/maintain the ambient air quality standards for particulate matter.
	File an Air Pollution Emission Notice (APEN) with state to include estimation of emission rates for each pollutant expected.		40 CFR 52^a	See discussion under Air Stripping.
	Include with the filed APEN the following: • Modeled impact analysis of source emissions • A Best Available Control Technology (BACT) review for the source operation	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52^a	See discussion under Air Stripping.

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Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Consolidation (cont'd.)	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[a]	See discussion under Air Stripping.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CFR 61[a]	See discussion under Air Stripping.
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[a]	See discussion under Air Stripping.
Containment (Construction of New Surface Impoundment Onsite) (See Closure with Waste in Place and Clean Closure)	Use two liners below the waste, a top liner that prevents waste migration into the liner, and a bottom liner that prevents waste migration through the liner throughout the post-closure period.	RCRA hazardous waste (listed or characteristic) currently being placed in a surface impoundment. Soil/debris being managed as RCRA hazardous waste.	40 CFR 264.220	If a new, onsite surface impoundment is constructed to hold influent and/or effluent from a treatment process, or to hold groundwater, surface water or leachate that is not a hazardous waste, these requirements are relevant and appropriate to construction, operation, and maintenance of the impoundment.
Dike Stabilization	Design and operate facility to prevent overtopping due to overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, or other equipment; and human error.	Existing surface impoundment containing hazardous waste or creation of new surface impoundments.	40 CFR 264.221	These requirements would be relevant and appropriate to the construction and operation of a new surface impoundment or the operation and maintenance of an existing surface impoundment onsite to contain groundwater, surface water, leachate, or the influent or effluent of a treatment system that is not a hazardous waste.
Direct Discharge of Treatment System Effluent	Applicable federal water quality criteria for the protection of aquatic life must be complied with when environmental factors are being considered.	Surface discharge of treated effluent.	50 FR 30784 (July 29, 1985)	
	Applicable federally approved state water quality standards must be complied with. These standards may be in addition to or more stringent than other federal standards under the CWA.	Surface discharge of treated effluent.	40 CFR 122.44 and state regulations approved under 40 CFR 131	If state regulations are more stringent than federal water quality standards, the state standards will be applicable to direct discharge. The state has authority under 40 CFR 131 to implement direct discharge requirements within the state, and should be contacted on a case-by-case basis when direct discharges are contemplated.
	The discharge must be consistent with the requirement of a Water Quality Management plan approved by EPA under Section 208(b) of the Clean Water Act.		CWA Section 208(b)	Discharge must comply with substantive but not administrative requirements of the management plan.
	Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.	Surface discharge of treated effluent.	40 CFR 122.44(a)	If treated effluent is discharged to surface waters, these treatment requirements will be applicable. Permitting and reporting requirements will be applicable only if the effluent is discharged at an offsite location. The permitting authority should be contacted on a case-by-case basis to determine effluent standards.
	The discharge must conform to applicable water quality requirements when the discharge affects a state other than the certifying state.	Surface water discharge affecting waters outside certifying state.	40 CFR 122.44(d)(4)	No discharge is expected to affect surface water outside certifying state.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Direct Discharge of Treatment System Effluent (cont'd.)	Discharge limitations must be established for all toxic pollutants that are or may be discharged at levels greater than those that can be achieved by technology-based standards.	Surface discharge of treated effluent.	40 CFR 122.44(e)	Exact limitations are based on review of the proposed treatment system and receiving water characteristics, and are usually determined on a case-by-case basis. The permitting authority should be contacted to determine effluent limitations.
	Discharger must be monitored to assure compliance. Discharge will monitor: • The mass of each pollutant discharged. • The volume of effluent discharged. • Frequency of discharge and other measurements as appropriate.	Surface discharge of treated effluent.	40 CFR 122.44(i)	These requirements are generally incorporated into permits, which are not required for onsite discharges. The substantive requirements are applicable, however, in that verifiable evidence must be offered that the discharge standards are being met. The permitting authority should be contacted to determine monitoring and operational requirements.
	Approved test methods for waste constituents to be monitored must be followed. Detailed requirements for analytical procedures and quality controls are provided.			
	Permit application information must be submitted, including a description of activities, listing of environmental permits, etc.		40 CFR 122.21	
	Monitor and report results as required by permit (at least annually).		40 CFR 122.44(i)	
	Comply with additional permit conditions such as: • Duty to mitigate any adverse effects of any discharge. • Proper operation and maintenance of treatment systems.		40 CFR 122.41(i)	
	Develop and implement a Best Management Practices (BMP) program and incorporate in the NPDES permit to prevent the release of toxic constituents to surface waters.	Surface water discharge.	40 CFR 125.100	These issues are determined on a case-by-case basis by the NPDES permitting authority for any proposed surface discharge of treated wastewater. Although a CERCLA site remediation is not required to obtain an NPDES permit for onsite discharges to surface waters, the substantive requirements of the NPDES permit program must be met by the remediation action if possible. The permitting authority should be consulted on a case-by-case basis to determine BMP requirements.
	The BMP program must: • Establish specific procedures for the control of toxic and hazardous pollutant spills. • Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure. • Assure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.		40 CFR 125.104	

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Direct Discharge of Treatment System Effluent (cont'd.)	Sample preservation procedures, container materials, and maximum allowable holding times are prescribed.	Surface water discharge.	40 CFR 136.1-136.4	These requirements are generally incorporated into permits, which are not required for onsite discharges. The substantive requirements are applicable, however, in that verifiable evidence must be offered that standards are being met. The permitting authority should be consulted on a case-by-case basis to determine analytical requirements.
Discharge to POTW[d]	Pollutants that pass through the POTW without treatment, interfere with POTW operation, or contaminate POTW sludge are prohibited.		40 CFR 403.5	If any liquid is discharged to a POTW, these requirements are applicable. In accordance with guidance, a discharge permit will be required even for an onsite discharge, since permitting is the only substantive control mechanism available to a POTW.
	Specific prohibitions preclude the discharge of pollutants to POTWs that: • Create a fire or explosion hazard in the POTW. • Are corrosive (pH<5.0). • Obstruct flow resulting in interference. • Are discharged at a flow rate and/or concentration that will result in interference. • Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW influent temperature above 104°F (40°C).			Categorical standards have not been promulgated for CERCLA sites, so discharge standards must be determined on a case-by-case basis, depending on the characteristics of the waste stream and the receiving POTW. Some municipalities have published standards for non-categorical, non-domestic discharges. Changes in the composition of the waste stream due to pretreatment process changes or the addition of new waste streams will require renegotiation of the permit conditions.
	Discharge must comply with local POTW pretreatment program, including POTW-specific pollutants, spill prevention program requirements, and reporting and monitoring requirements.		40 CFR 403.5 and local POTW regulations	
	RCRA permit-by-rule requirements must be complied with for discharges of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe.		40 CFR 264.71 and 40 CFR 264.72	

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Discharge of Dredge and Fill Material to Navigable Waters	The five conditions that must be satisfied before dredge and fill is an allowable alternative are: • There must be no practicable alternative. • Discharge of dredged or fill material must not cause a violation of state water quality standards, violate any applicable toxic effluent standards, jeopardize an endangered species, or injure a marine sanctuary. • No discharge shall be permitted that will cause or contribute to significant degradation of the water. • Appropriate steps to minimize adverse effects must be taken. • Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystem.		40 CFR 230.10 33 CFR 320-330	This action is not envisioned as part of the site remediation.
Dredging	Removal of all contaminated sediment.	Disposal by disturbance of hazardous waste and moving it outside the unit or area of contamination.	See discussions under Clean Closure, Consolidation, Capping	
Excavation	Area from which materials are excavated may require cleanup to levels established by closure requirements.	Disposal by disturbance of hazardous waste and moving it outside the unit or area of contamination.	40 CFR 264 Disposal and Closure Requirements	If contaminated materials that are not hazardous wastes are excavated from the site during remediation, the RCRA requirements for disposal and site closure (of the excavated area) may become relevant and appropriate. See discussions under Capping, Clean Closure, Closure with Waste In-Place, etc. If the excavated materials can be classified as hazardous wastes, the disposal and closure requirements would be applicable.
	Movement of excavated materials to a previously uncontaminated, onsite location, and placement in or on land may trigger land disposal restrictions.	Materials containing RCRA hazardous wastes subject to land disposal restrictions.	40 CFR 268 (Subpart D)	The land disposal restrictions restrict disposal of certain hazardous wastes. Some municipal landfill wastes may be derived from or may be sufficiently similar to restricted wastes to make the land disposal restrictions relevant and appropriate. For wastes that can be classified as restricted hazardous wastes, land disposal is prohibited unless they are treated to defined standards. Chemical characterization of the wastes will be necessary to determine the applicability or relevance of this requirement.
	All listed and characteristic hazardous wastes or soils and debris contaminated by a RCRA hazardous waste and removed from a CERCLA site may not be land disposed until treated as required by Land Ban. If alternative treatment technologies can achieve treatment similar to that required by Land Ban, and if this achievement can be documented, then a variance may not be required.	Waste disposed was RCRA waste.	40 CFR 268	If soil is a characteristic waste, and if waste disposed prior to November 1980 is now designated as a RCRA waste, then soils/sediment and leachate contamination from those wastes must be managed as a RCRA waste.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Excavation (cont'd.)	Develop fugitive and odor emission control plan for this action if existing site plan is inadequate.		CAA Section 101[a] and 40 CFR 52[a]	See discussions under Consolidation.
	File an Air Pollution Emission Notice (APEN) with state to include estimation of emission rates for each pollutant expected.		40 CFR 52[a]	See discussions under Consolidation.
	Include with the filed APEN the following: • Modeled impact analysis of source emissions. • A Best Available Control Technology (BACT) review for the source operation.	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52[a]	See discussions under Consolidation.
	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[a]	See discussions under Consolidation.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CFR 61[a]	See discussions under Consolidation.
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[a]	See discussions under Consolidation.
Gas Collection	*Proposed* standards for control of emissions of volatile organics (CAA requirements to be provided).	Proposed standard; not yet ARAR.	52 FR 3748 (February 5, 1987)	This is a proposed rule. If the requirement is finalized in its proposed form, it may be applicable or relevant and appropriate to some of the remedial actions at municipal landfill sites. The proposed standard would impose restrictions on RCRA treatment, storage, and disposal facilities that would limit the allowable emissions of volatile organics from these facilities. If this requirement is finalized, it will be closely examined with respect to remedial alternatives at municipal landfill sites.
	Design system to provide odor-free operation.		CAA Section 101[a] and 40 CFR 52[a]	See discussions under Consolidation.
	File an Air Pollution Emission Notice (APEN) with state to include estimation of emission rates for each pollutant expected.		40 CFR 52[a]	See discussions under Consolidation.
	Include with the filed APEN the following: • Modeled impact analysis of source emissions. • A Best Available Control Technology (BACT) review for the source operation.	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52[a]	See discussions under Consolidation.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Gas Collection (cont'd.)	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[a]	See discussions under Consolidation.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CFR 61[a]	
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[a]	See discussions under Consolidation.
Groundwater Diversion	Excavation of soil for construction of slurry wall may trigger cleanup or land disposal restrictions.	Disposal by disturbance of hazardous waste and moving it outside the unit or area of contamination.	See Consolidation, Excavation in this table.	If waste materials or contaminated soil that are not hazardous wastes are excavated or otherwise disturbed during the construction of a groundwater diversion structure, the requirements of this section would be relevant and appropriate. If the excavated wastes or contaminated soil can be classified as hazardous wastes, these requirements would be applicable.
Incineration (Onsite)	Analyze the waste feed.	RCRA hazardous waste.	40 CFR 264.341	If incineration is selected as one of the remedial alternatives for site remediation, these requirements would be relevant and appropriate to the disposal by incineration of potentially nonhazardous site wastes. The wastes would have to be analyzed prior to incineration to insure that the wastes cannot be classified as hazardous wastes.
	Dispose of all hazardous waste and residues, including ash, scrubber water, and scrubber sludge.		40 CFR 264.351	
	No further requirements apply to incinerators that only burn wastes listed as hazardous solely by virtue of the characteristic of ignitability, corrosivity, or both; or the characteristic of reactivity if the wastes will not be burned when other hazardous wastes are present in the combustion zone; and if the waste analysis shows that the wastes contain none of the hazardous constituents listed in Appendix VIII which might reasonably be expected to be present.		40 CFR 264.340	If wastes to be incinerated can be classified as hazardous wastes, the requirements of 40 CFR 264.341, 351, and 340 would be applicable.
	Performance standards for incinerators:			
	• Achieve a destruction and removal efficiency of 99.99 percent for each principal organic hazardous constituent in the waste feed and 99.9999 percent for PCBs and dioxins.		40 CFR 264.343	
	• Particulate emissions must be less than 180 mg/dscf (.08 grains/dscf) corrected to 7% O_2.		40 CFR 264.342	
	• Reduce hydrogen chloride emissions to 1.8 kg/hr or 1 percent of the HCl in the stack gases before entering any pollution control devices.			

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

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Actions	Requirement	Prerequisites	Citation	Comments
Incineration (Onsite) (cont'd.)	Monitoring of various parameters during operation of the incinerator is required. These parameters include: • Combustion temperature. • Waste feed rate. • An indicator of combustion gas velocity. • Carbon monoxide.		40 CFR 264.343	
Land Treatment	Ensure that hazardous constituents are degraded, transformed, or immobilized within the treatment zone.	RCRA hazardous waste.	40 CFR 264.271	See discussions under Consolidation.
	Maximum depth of treatment zone must be no more than 1.5 meters (5 feet) from the initial soil surface, and more than 1 meter (3 feet) above the seasonal high water table.		40 CFR 264.271	
	Demonstrate that hazardous constituents for each waste can be completely degraded, transformed, or immobilized in the treatment zone.		40 CFR 264.272	
	Minimize run-off of hazardous constituents.		40 CFR 264.273	
	Maintain run-on/run-off control and management system.		40 CFR 264.273	
	Special application conditions if food-chain crops are grown in or on treatment zone.		40 CFR 264.276	
	Unsaturated zone monitoring.		40 CFR 264.278	
	Special requirements for ignitable or reactive waste.		40 CFR 264.281	
	Special requirements for incompatible wastes.		40 CFR 264.282	
	Special requirements for RCRA hazardous wastes.	RCRA waste No's. F020, F021, F022, F023, F026, F027.	40 CFR 264.283	
	Design system to operate odor free.		CAA Section 101^a and 40 CFR 52^a	
	File an Air Pollution Emission Notice (APEN) with state to include estimation of emission rates for each pollutant expected.		40 CFR 52^a	See discussions under Consolidation.
	Include with the filed APEN the following: • Modeled impact analysis of source emissions. • A Best Available Control Technology (BACT) review for the source operation.	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52^a	See discussions under Consolidation.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
and Treatment (cont'd.)	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52ª	See discussions under Consolidation.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CFR 61ª	See discussions under Consolidation.
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61ª	See discussion under Consolidation.
Operation and Maintenance (O&M)	Post-closure care to ensure that site is maintained and monitored.		40 CFR 264.118 (RCRA, Subpart G)	Post-closure requirements for operation and maintenance of municipal landfill sites are relevant and appropriate to new disposal units with nonhazardous waste, or existing units capped in-place. In cases where municipal landfill site wastes are determined to be hazardous wastes, and new disposal units are created, the post-closure requirements will be applicable.
Removal	General performance standard requires minimization of need for further maintenance and control; minimization or elimination of post closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products.	Disturbance of RCRA hazardous waste (listed or characteristic) and movement outside the unit or area of contamination. May apply to surface impoundment or to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation and returned to land.	40 CFR 264.111	Clean closure removal of contaminated materials does not appear to be feasible for municipal landfill sites in general due to the lack of suitable offsite treatment or disposal facilities to accept the large volume of wastes typically found at municipal landfill sites and the impossibility of meeting the requirement at a site with contaminated groundwater. However, clean closure removal may be considered for portions (hot spots) of municipal landfill sites. The RCRA clean closure requirements would be considered relevant and appropriate to contaminated wastes which are not hazardous, but which are similar to hazardous wastes.
	Disposal or decontamination of equipment, structures, and soils.		40 CFR 264.111	
	Removal or decontamination of all waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.	Not applicable to undisturbed material. Disposal of RCRA hazardous waste (listed or characteristic) after disturbance and movement outside the unit or area of contamination.	40 CFR 264.228(a)(1) and 40 CFR 264.258	In the event that the wastes being removed are determined to be hazardous wastes, the requirements of this section would be applicable.
	Meet health-based levels at unit.		40 CFR 244.111	
	RCRA hazardous wastes are subject to land disposal restrictions. Land disposal restrictions set performance requirements on treatment of the wastes before land disposal. The effective date for final group of RCRA wastes is May 8, 1990. Extensions to the effective dates have been granted for specific RCRA wastes that are contained in soil and/or debris.	Management of listed hazardous waste.	40 CFR 268	If the wastes found at the municipal landfill site are found to be RCRA wastes, the Land Disposal Restrictions will be applicable. If the wastes are not RCRA wastes but contain the same or similar constituents to those in RCRA wastes, then the Land Disposal Restrictions may be relevant and appropriate.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Slurry Wall	Excavation of soil for construction of slurry wall may trigger cleanup or land disposal restrictions.	Disposal by disturbance of hazardous waste and moving it outside the unit or area of contamination.	See Consolidation, Excavation in this table.	See discussions under Consolidation and Excavation.
Surface Water Control	Prevent run-on, and control and collect runoff from a 24-hour, 25-year storm (waste piles, land treatment facilities, landfills).	Land based treatment, storage, or disposal units.	40 CFR 264.251(c)(d) 40 CFR 264.273(c)(d) 40 CFR 264.301(c)(d)	The requirements for control of run-on and run-off will be relevant and appropriate to all remediation alternatives that manage nonhazardous waste and include onsite land-based treatment, storage, or disposal. The requirements will be applicable to any remediation measures that include land-based treatment, storage, or disposal of hazardous wastes.
	Prevent over-topping of surface impoundment.		40 CFR 264.221(c)	This requirement will be relevant and appropriate to the construction and operation of an onsite surface impoundment, or to operation of an existing onsite surface impoundment managing nonhazardous wastes. These requirements would be applicable to the construction or operation of a surface impoundment for the storage or treatment of hazardous waste.
Treatment	Standards for miscellaneous units (long-term retrievable storage, thermal treatment other than incinerators, open burning, open detonation, chemical, physical, and biological treatment units using other than tanks, surface impoundments, or land treatment units) require new miscellaneous units to satisfy environmental performance standards by protection of groundwater, surface water, and air quality, and by limiting surface and subsurface migration.	Use of other units for treatment of hazardous wastes. These units do not meet the definitions for units regulated elsewhere under RCRA.	40 CFR 264 (Subpart X)	The requirement will be relevant and appropriate to the construction, operation, maintenance, and closure of any miscellaneous treatment unit (a treatment unit that is not elsewhere regulated) constructed on municipal landfill site for treatment and/or disposal of nonhazardous wastes. These requirements would be applicable to the construction and operation of a miscellaneous treatment unit for the treatment and/or disposal of hazardous wastes.
	Treatment of wastes subject to ban on land disposal must attain levels achievable by best demonstrated available treatment technologies (BDAT) for each hazardous constituent in each listed waste.	Effective date for CERCLA actions is November 8, 1988, for F001-F005 hazardous wastes, dioxin wastes, and certain "California List" wastes. Other restricted wastes have different effective dates as promulgated in 40 CFR 268.	40 CFR 268 (Subpart D)	These regulations are applicable to the disposal of any municipal landfill site waste that can be defined as restricted wastes. These requirements are relevant and appropriate to the treatment prior to land disposal of any wastes that contain components of restricted wastes in concentrations that make the site wastes sufficiently similar to the regulated wastes. The requirements specify levels of treatment that must be attained prior to land disposal.
	Prepare fugitive and odor emission control plan for this action.		CAA Section 101[a] and 40 CFR 52[a]	See discussions under Consolidation.
	File an Air Pollution Emission Notice (APEN) with state to include estimation of emission rates for each pollutant expected.		40 CFR 52[a]	See discussions under Consolidation.
	Include with the filed APEN the following: • Modeled impact analysis of source emissions. • A Best Available Control Technology (BACT) review for the source operation.	This additional work and information is normally applicable to sources meeting the "major" criteria and/or to sources proposed for nonattainment areas.	40 CFR 52[a]	See discussions under Consolidation.

Table 5-3
POTENTIAL FEDERAL ACTION-SPECIFIC ARARs FOR MUNICIPAL LANDFILL SITES

Actions	Requirement	Prerequisites	Citation	Comments
Treatment (cont'd.)	Predict total emissions of volatile organic compounds (VOCs) to demonstrate emissions do not exceed 450 lb/hr, 3,000 lb/day, 10 gal/day, or allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).	Source operation must be in an ozone nonattainment area.	40 CFR 52[a]	See discussions under Consolidation.
	Verify through emission estimates and dispersion modeling that hydrogen sulfide emissions do not create an ambient concentration greater than or equal to 0.10 ppm.		40 CFR 61[a]	See discussions under Consolidation.
	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulations.		40 CFR 61[a]	See discussions under Consolidation.
Underground Injection of Wastes and Treated Groundwater	UIC program prohibits: • Injection activities that allow movement of contaminants into underground sources of drinking water (USDW) and result in violations of MCLs or adversely affect health. • Construction of new Class IV wells, and operation and maintenance of existing wells. Wells used to inject contaminated groundwater that has been treated and is being reinjected into the same formation from which it was withdrawn are not prohibited if activity is part of CERCLA or RCRA actions.		40 CFR 144.12 40 CFR 144.13 40 CFR 144.14	
	All hazardous waste injection wells must also comply with the RCRA requirements.		40 CFR 144.16	
Waste Pile	Use liner and leachate collection and removal system.	RCRA hazardous waste, non-containerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage.	40 CFR 264.251	

Notes:

[a] All of the Clean Air Act ARARs that have been established by the federal government may be covered by matching state regulations. The state may have the authority to manage these programs through the approval of its implementation plans (40 CFR 52 Subpart G).

[b] Action alternatives from ROD keyword index.

[c] Bulk storage requires the preparation and implementation of a spill prevention, control, countermeasures (SPCC) plan (see 40 CFR 761.65(c)(7)(ii) for specification of container sizes that are considered "bulk" storage containers). Substantive requirements may be ARARs if bulk storage is performed onsite.

[d] These regulations apply regardless of whether the remedial action discharges into the sewer or trucks the waste to an inlet to the sewage conveyance system located "upstream" of the POTW.

[e] An *approved incinerator* (under Section 761.70) can be used to destroy any concentration of PCBs; a *high-efficiency boiler* approved under Section 761.60(a)(2)(iii) can be used for mineral oil dielectric fluid from PCB-contaminated electrical equipment containing PCBs in concentrations greater than or equal to 50 ppm but less than 500 ppm; and a *RCRA-approved incinerator* (under RCRA paragraph 3005(a)) can be used for PCBs that and not subject to the incineration requirements of TSCA.

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PHASED/INTERIM REMEDIAL ALERNATIVES REPORT
WELLSVILLE-ANDOVER LANDFILL SITE
TOWNS OF WELLSVILLE AND ANDOVER
ALLEGANY COUNTY, NEW YORK
SITE NUMBER 9-02-004

April 1992

Prepared for:

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1. INTRODUCTION

The remedial investigation/feasibility study (RI/FS) process for Class 2 sites requires the identification of feasible technologies that are screened and organized into various remedial alternatives. For source-control options at Class 2, non-RCRA-regulated landfills, this process may be simplified and accelerated due to their generally large size and composition. These landfills typically contain substantial quantities of municipal solid waste (MSW) mixed with smaller quantities of hazardous waste. While a complete RI/FS is warranted at these sites to determine the full extent of contamination and to identify any risks posed to human health and/or the environment, certain remedial measures can be evaluated very early in the RI/FS process for possible implementation. These evaluations are based on historic data, early treatability tests, risk assessment, or technology-based results with a bias for initiating appropriate remedial measures.

Using the available background data and data obtained during Phase I of the RI, the need for a Phased or Interim Remedial Action (PIRA) was evaluated based on significant problems or issues involving the site and surrounding areas. The following questions were posed in an attempt to identify problems or issues relevant to the site:

- Does a threat to human health and the environment exist;
- Is there an identified source; and
- How can the threat be reduced or eliminated?

Once a problem was identified, a list of interim objectives was developed aimed at correcting or reducing the problems, and a list of specific alternatives was developed to meet these objectives. The alternatives consist of technologies deemed applicable to Class 2, non-RCRA MSW landfills, and typically include placement of a final cover, installation of a leachate collection system, and treatment of collected leachate.

In the case of the Wellsville-Andover Landfill, the latter two options are already partially in place. Other actions that were considered at an early stage of this investigation were the reduction of both groundwater and surface water flow into the landfill. Specific actions that were identified in the RI/FS Work Plan for potential development of PIRAs are:

- Phased placement of a final cover or repair of the existing surface-water exclusion systems;
- Improving or increasing leachate storage capacity;
- Improving operation and maintenance procedures for the leachate collection system;
- Installing a groundwater cutoff wall on the northern edge of the landfill; and
- Improving the surface water cutoff ditch on the northern edge of the landfill.

This report evaluates the need for a PIRA at the Wellsville-Andover Landfill based on a review of historical data and conditions identified in the Phase I RI. It then evaluates interim remedial alternatives and presents conclusions and recommendations based on these evaluations.

2. EXISTING CONDITIONS

2.1 SITE DESCRIPTION

The Wellsville-Andover Landfill (Site Number 902004) is located on Snyder Road (formerly Gorman Road) in the township of Wellsville, a sparsely populated, rural area of Allegany County (see Figure 2-1). The site measures approximately 4,000 feet north to south by 1,500 feet east to west for a total area of approximately 120 acres. The northernmost portion of the site, consisting of approximately 35 acres, has not been used for waste deposition. The landfill is located on a hillside with nearly 180 feet of relief from north to south. Duffy Hollow Creek, a Class D stream, is located approximately 1,500 feet east of the site, and an unnamed tributary located west of Snyder Road converges with Duffy Hollow Creek approximately 3,000 feet southeast of the site. Man-made containment ditches flow along portions of the north and east sides of the landfill. These ditches are designed to prevent off-site surface drainage from entering the site.

2.2 SITE HISTORY

The Wellsville-Andover Landfill was operated by the village of Wellsville from 1964 to 1983. The site consists of four fill areas (see Figure 2-2). The south, south-central, and northwest fill areas accepted both municipal and industrial waste from 1964 to 1978. The northeast fill area, open from 1978 to 1983, accepted only municipal waste. As detailed in NYSDEC's 1983 Phase I Investigation Report, more than 300 tons of hazardous and industrial wastes are estimated to have been placed in the landfill, including trichloroethene (TCE) sludge, methylene chloride, plastics, polyester scraps, pumice, detergents, lead carbonate, sodium cyanide salt, cutting oils, chromium and zinc chromate paints, solvents, coolants, and lubricating oils.

Only the northeast fill area had a leachate collection system installed prior to waste deposition. However, no liner was installed prior to waste deposition in any of the fill areas. The three older fill areas were in operation prior to current regulatory requirements for the design and operation of landfills, and no accurate documentation of the location or construction of cells in these areas was recorded. The available information suggests that the trench method of landfill operation was used, and that the depth of waste varies but probably is less than 14 feet below ground surface.

According to the Phase II Superfund Investigation Report (Malcolm Pirnie 1986), the village of Wellsville installed a leachate collection system (LCS) along the west side and central portion of the site in 1985 to curtail the off-site migration of leachate (see Figure 2-2). The system consists of a series of perforated 6-inch polyvinyl chloride (PVC) pipes in trenches backfilled with No. 2 round stone. The pipes were installed at depths of approximately 9 to 14 feet, which is below the estimated depth of the fill material. The layout of the system was based on the assumed direction of local groundwater flow, which is from north to southwest in the central and western portion of the landfill. Two main lines run along the west and south sides of the site. The west leg branches and is connected to the LCS installed in the northeast fill area in 1978. Lateral lines with vertical risers at the terminal ends were extended from the main lines into areas displaying visible leachate seeps. Leachate collected in the northern and central portions of the landfill flows by gravity to a pair of 10,000-gallon holding tanks adjacent to Pump Station No. 1 (PS-1) (see Figure 2-2). Leachate from the southern fill area flows by gravity to Pump Station No. 2 (PS-2), which consists of a cistern with a submersible pump. PS-2, which does not presently operate, is designed to pump to holding tanks at PS-1. Currently, leachate collected from the southern fill area overflows from PS-2 and flows along the ground surface to a roadside ditch. An 80,000-gallon lagoon located within the confines of the site near PS-1 is designed to store excess leachate generated at the site. The lagoon is unlined and overflows during wet weather periods.

Leachate Collection (Pumping) Operations

Daily operations at the site were observed during a visit by E & E personnel. The following description of those operations as well as the flow diagram shown in Figure 2-3 are based on these observations and discussions with site personnel.

Leachate is transported daily by tanker truck from the lagoon to the Wellsville Sewage Treatment Plant (STP). Upon arrival at the site in the morning, the tanker operator performs a visual inspection of the LCS in the area around PS-1. During this inspection, the leachate levels are checked in the two holding tanks (T-1 and T-2), the overflow pond, and the inflows from the uphill LCS and PS-2.

The operator then opens the leachate drain valve (V-7) allowing leachate to drain from the overflow pond into holding tanks T-1 and T-2. He then connects the tanker fill hose to the stand pipe located on the concrete pad north of PS-1. Once the connection is made, the three-way control valve located in the valve pit (V-5) is turned to the "truck fill" position. The pump control is then switched from automatic to manual and the truck is filled.

After the truck is filled the pump is switched back to automatic and the control valve turned to "lagoon-out." At this setting the lagoon continues to drain into the holding tanks at a slow rate through the drain valve (V-7). If the tanks become full, the pump, now in the automatic mode, turns on and pumps leachate from the holding tanks through the control valve and back to the lagoon. The system is left in this condition while the operator delivers the load to the village of Wellsville STP.

This process is continued throughout the day and a maximum of six truckloads (30,000 gallons total) of leachate is delivered to the STP. At the end of the last load, the operator closes the lagoon drain (V-7) and leaves the system in the automatic mode. Leachate continues to flow from PS-2 (when it is functioning), which is a simple sump-pump set up, into S-1. From S-1 it drains into T-1 and T-2, and from there it is pumped into the lagoon if a high level condition exists.

Leachate Generation

During the evaluation of the landfill for the PIRA, estimates of the monthly and mean annual leachate generation rates were calculated. These calculations were performed using a simple water-balance model described in Design, Construction, and Monitoring of Sanitary Landfill (A. Bagchi 1990).

The model uses the algebraic sum of the precipitation volume (P), surface runoff volume (R), and evapotranspiration volume (Ev) to predict total leachate generation (Lv).

$$Lv = P - (R + Ev)$$

Using this equation, Figure 2-4 was created comparing the theoretical leachate volume generated to the actual volume recovered as reported by the village of Wellsville. The area between the two curves indicates the estimated volume of leachate that escaped to the environment in 1990. This uncollected leachate is assumed to have migrated vertically and horizontally from the landfill into the local groundwater and surface water.

In assessing the impact of the estimated leachate volume, it should be noted that groundwater flow has not been accounted for. Presently there is not enough information to determine whether groundwater flows through the refuse, and if so, in what quantities. It is also unknown whether groundwater enters the leachate collection system directly without passing through the landfill. This information will be obtained during the Phase II RI investigation.

In addition to the above calculations, an estimate of the LCS flow rates was made based on field observations. On the day of the site visit, (March 18, 1992, an average wet period, spring day) 20,000 gallons (four truckloads) was removed from the LCS during a 4-hour period. During this time, the water level in the LCS overflow pond dropped 4 inches. The surface area of the overflow pond is approximately 4,400 square feet. Therefore, the LCS flow rate is estimated to be approximately 60,000 gallons per day (gpd).

The current operations at the site allow for a maximum collection of 30,000 gpd leachate. At this rate, only 50% of the leachate in the LCS could be collected for treatment during a typical "wet" period. Conversations with site employees indicated that during periods of heavier precipitation or snow melt, the transfer pump cannot keep up with the inflow. The capacity of the transfer pump is estimated to be between 250 and 500 gpm. Therefore, extremely high flows would be at greater than 360,000 gpd, or more than 10 times the collection rate.

Based on the field observations and meteorological data for the Wellsville area, it is assumed that for approximately 90 days a year the LCS would flow at an average rate of 60,000 gpd or 90 2.7 million gal/year (mgy). Subtracting this volume and the volume collected by the village in 1990 (8.8 mgy) from the theoretical volume of leachate generated (20.2 mgy) the annual flow of leachate to the groundwater would be 8.7 mgy.

Leachate Quality

In an attempt to determine the impact of the leachate overflow problem, available data on the types and respective concentrations of contaminants in the leachate was reviewed, including the 1986 Malcolm Pirnie report, which identified six VOCs (including vinyl chloride, TCE, and trans-1,2-dichloroethane) above background groundwater levels. These samples were taken from a trench along the east side of the landfill and the leachate sump, which is located near PS-1.

The Phase I RI identified only three VOCs in the leachate, of which only TCE was above NYSDEC Class C surface water standards. The two samples were collected from Manhole No. 4 and PS-2. It was noted in the Phase I RI report that there was very little flow in the LCS at the time of sampling. This may have had a bearing on the VOC concentrations that were detected, especially if there is groundwater inflow into the LCS, as is suspected.

In addition, the Phase I RI analytical results of air samples collected from risers and manholes in the LCS identified several VOCs above 10 ppm.

In addition to the samples that were analyzed for TCL compounds, leachate samples were also analyzed for conventional pollution parameters by RCRA Research in 1979 (see Table 2-2). The village of Wellsville was contacted for a more current analysis of the leachate but no current data was available. The RCRA Research samples identified several parameters that exceed discharge standards under the State Pollution Discharge Elimination System (SPDES) program. The most significant environmental impact would be caused by the excessive oxygen demand of the leachate.

The following calculations, which are based on the available data, illustrate the magnitude of the impact:

Assume: Average wet weather leachate overflow = 30,000 gpd (based on field observations)
: average chemical oxygen demand (COD) = 4,000 mg/L (approximately 1/3 of average 1979 concentrations)
: average 5-day biological oxygen demand (BOD_5) = ½ COD = 2,000 mg/L

Then the BOD_5 loading to surface water

$$= \frac{0.03 \text{ mgd} \times 5{,}900 \text{ mg/L} \times 8.34 \quad \text{lb}}{\text{Mg(mg/L)}}$$

$$= 500 \text{ lb/day } BOD_5$$

In comparison, a typical single-family home or mobile home generates an average of 0.17 lb/day of BOD_5. Therefore, a community of 1,000 persons directly discharging their waste water would add only 170 lb/day of BOD_5 or one third of the leachate loading. If the actual BOD_5 discharges are of this order of magnitude, it is assumed that there are environmental impacts associated with the leachate.

The uncontrolled release of leachate to the unnamed tributary will continue to contravene NYSDEC surface water standards as long as the landfill remains in its current state. Because this tributary feeds Duffy Hollow Creek south of the landfill, the water quality of Duffy Hollow Creek could also be impacted. However, the tributary is an intermittent water body, which makes its impact on Duffy Hollow Creek difficult to quantify without a long-term study.

Groundwater Quality

Although there is some question as to the levels of VOCs in the leachate overflow, VOCs have been detected in groundwater samples collected in the vicinity of the site. Analysis of samples collected from local springs to the southeast of the site and from monitoring wells located to the east and south of the site detected in the same VOCs that were identified in the leachate samples. Six of the VOCs--1,1-dichloroethene, 1,2-dichloroethane, total-dichloroethene, toluene, trichloroethene, and vinyl chloride (DCE, DCA, tDCE, toluene, TCE, and VC)--have been identified as contaminants of concern in the Phase I RI report.

Site Access

In addition to the leachate overflow and groundwater contamination, the Phase I RI also identified controlling site access as a potential concern. There is evidence of trespassing by hunters, model airplane enthusiasts, and ATV operators. Of these, the ATV operators are the most significant problem. The use of ATVs causes disturbance and erosion of the existing ground cover. They will also cause damage to the final cover when it is place, which would increase the long-term operational cost of the landfill. The Phase I RI health risk evaluation also identified these trespassers as potential receptors of direct exposure to on-site contaminants.

Table 2-1

WELLSVILLE LEACHATE ANALYSIS (RCRA 1979)

Report Date: 10/15/79
Sample Date: 9/26/79

Composite Samples		Sample Identification		
Parameter	**Units of Measure**	**Northwest Fill Area**	**Central Fill Area**	**South Fill Area**
pH	Standard Units	6.27	6.36	6.59
Total acidicy (pH = 8.3)	% as HCl	0.26	0.54	0.15
Total alkalinity (pH = 4.5)	mg/L as $CaCo_3$	3,720	3,260	2,790
Conductivity	μmhos/cm	7.050	6,100	5,650
Total solids (103°C)	mg/L	10,500	8,370	6,890
Total dissolved solids (103°C)	mg/L	10,400	7,450	6,190
Total suspended solids	mg/L	102	915	708
Chloride	mg/L	808	863	590
Fluoride	mg/L	0.716	0.514	0.315
Biochemical oxygen demand - 5 day	mg/L	2,910	1,770	930
Chemical oxygen demand	mg/L	16,300	10,900	8,230
Sulfate	mg/L	24	36	6.0
Sulfide	mg/L	22.1	47.0	43.6
Total cyanide	mg/L	<0.05	<0.05	<0.05
	mg N/L	1.8	1.1	1.5
	mg N/L	0.500	0.650	1.82
Ammonia	mg N/L	61.8	96.4	108
Total kjeldhal nitrogen	mg N/L	62	98	110
Total phosphorus	mg P/L	0.056	0.300	0.183
Total organic carbon	mg/L	3,640	3,010	2,300
Total inorganic carbon	mg/L	210	194	196
Total grease and oils	mg/L	579	921	291
Total phenol	mg/L	3.78	2.00	28.5
Soluble cadmium	mg/L	0.018	<0.003	<0.003
Soluble chromium	mg/L	0.018	0.006	<0.002
Soluble copper	mg/L	0.072	0.003	0.003

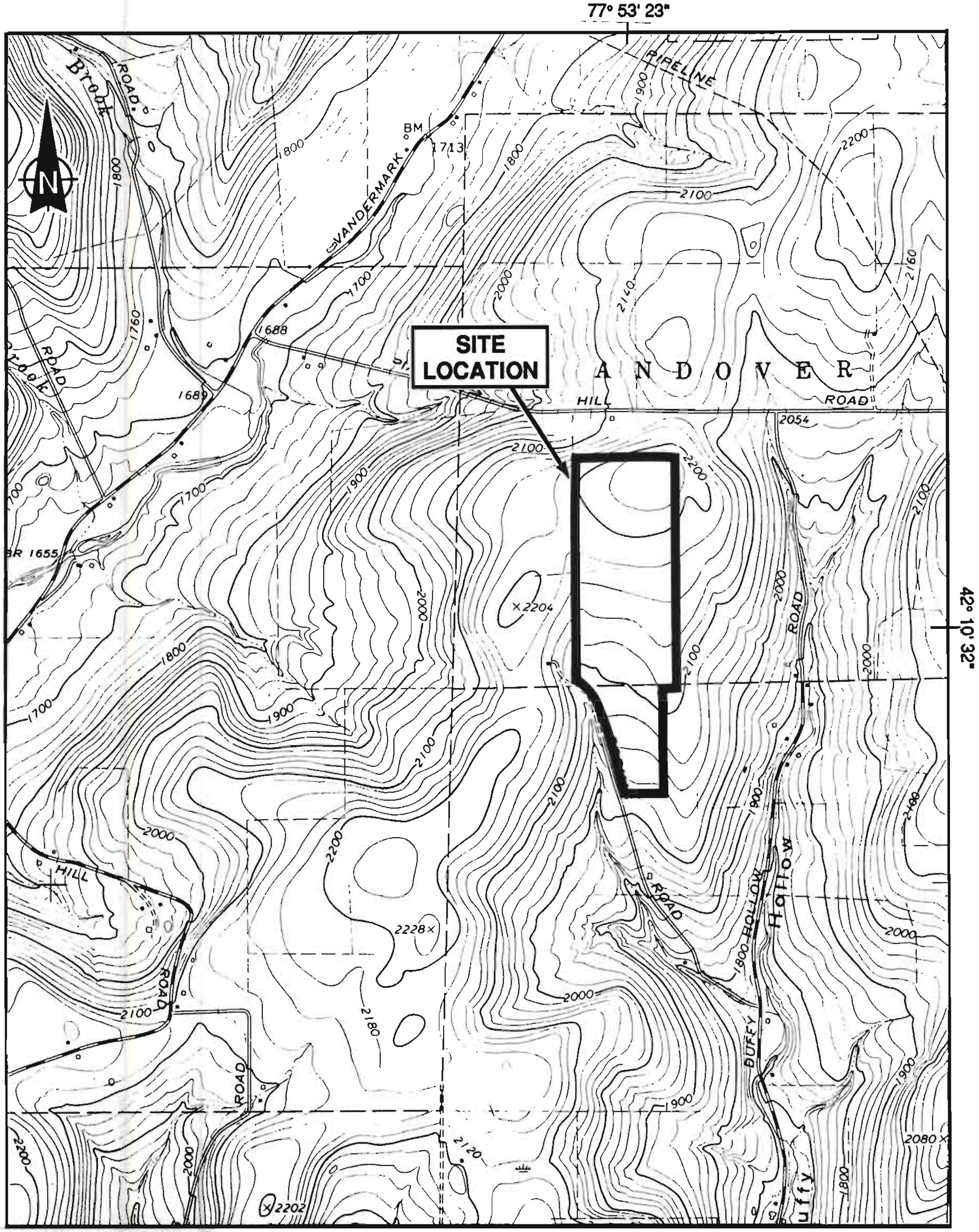
Table 2-1

WELLSVILLE LEACHATE ANALYSIS (RCRA 1979)

Report Date: 10/15/79
Sample Date: 9/26/79

Composite Samples		Sample Identification		
Parameter	**Units of Measure**	**Northwest Fill Area**	**Central Fill Area**	**South Fill Area**
Soluble iron	mg/L	1,300	420	460
Soluble lead	mg/L	<0.02	<0.02	<0.02
Soluble manganese	mg/L	84.0	78.0	20.0
Soluble nickel	mg/L	<0.02	<0.02	<0.02
Soluble mercury	mg/L	<0.7	<0.7	<0.7
Soluble zinc	µg/L	0.132	0.296	0.041
Halogenated organic scan	µg/L as Chlorine; Lindane Standard	0.33	0.51	0.24
Total volatile chlorinated organic scan	µg/L as Chlorine; Carbon Tetrachloride Standard	93,800	18,900	12,200

Source:



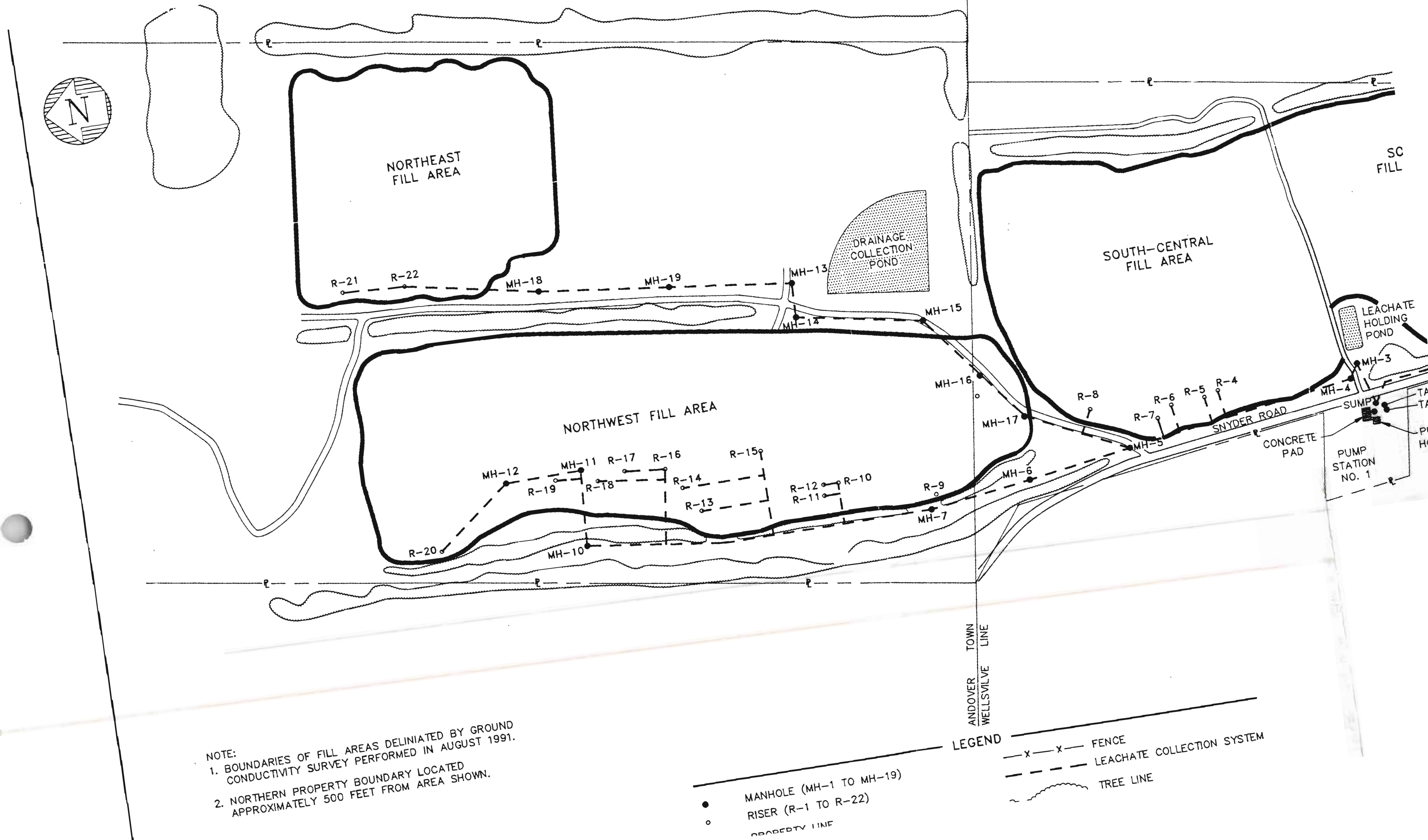
SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangle, Wellsville North, NY 1965.

SCALE 1:24,000

0 ½ 1 Mile

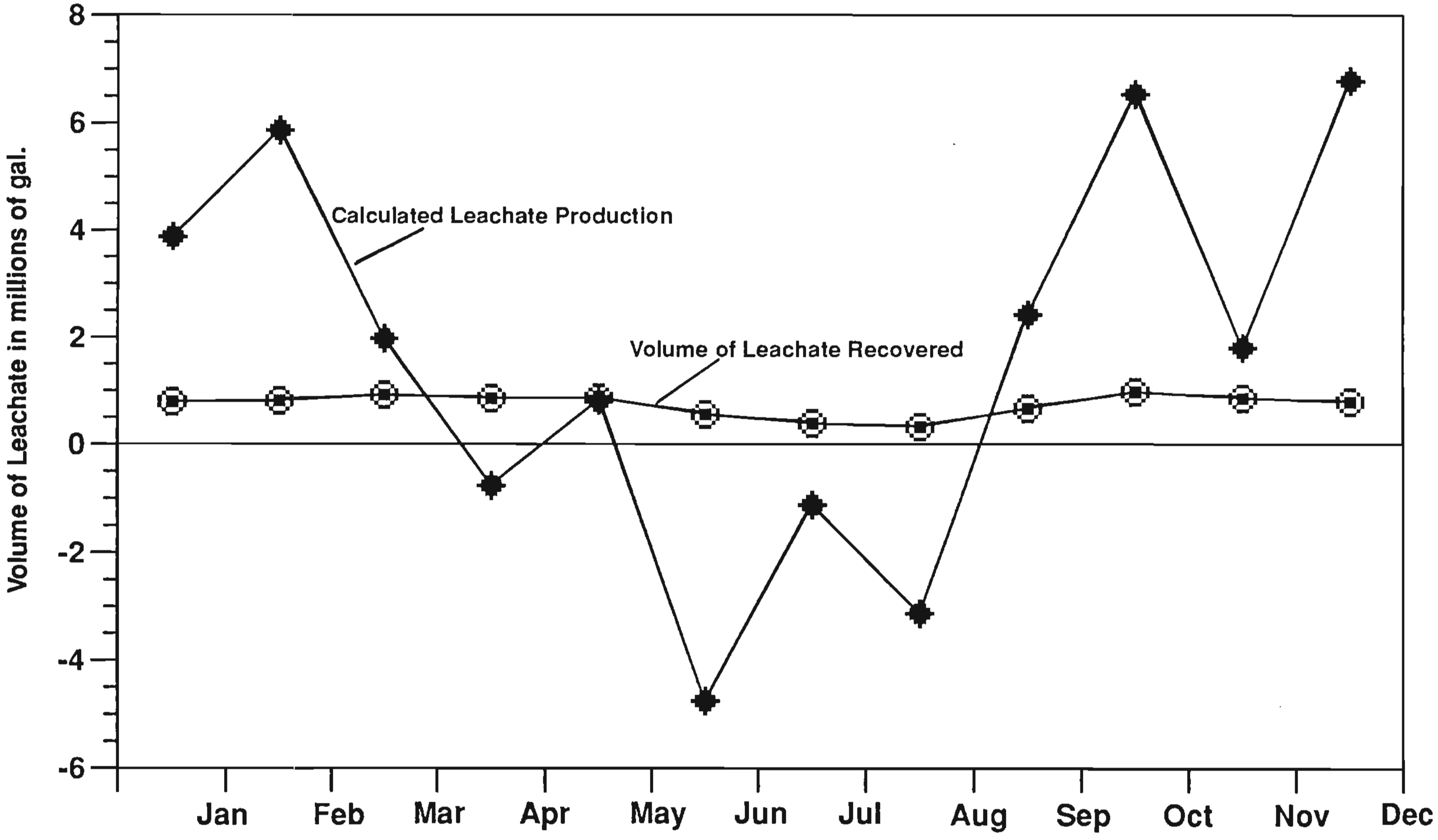
0 .5 1 Kilometer

Figure 2-1
SITE LOCATION MAP, WELLSVILLE-ANDOVER LANDFILL



NOTE:

1. BOUNDARIES OF FILL AREAS DELINIATED BY GROUND CONDUCTIVITY SURVEY PERFORMED IN AUGUST 1991.
2. NORTHERN PROPERTY BOUNDARY LOCATED APPROXIMATELY 500 FEET FROM AREA SHOWN.



Total Calculated Leachate Generated	20.2 Mgal
Total Leachate Collected by Wellsville	8.8 Mgal
Total Estimated Overflowing to Surface Water	2.7 Mgal
Total Estimated Migrating to Groundwater	8.7 Mgal

Figure 2-4
WELLSVILLE-ANDOVER LANDFILL
WATER BALANCE 1990

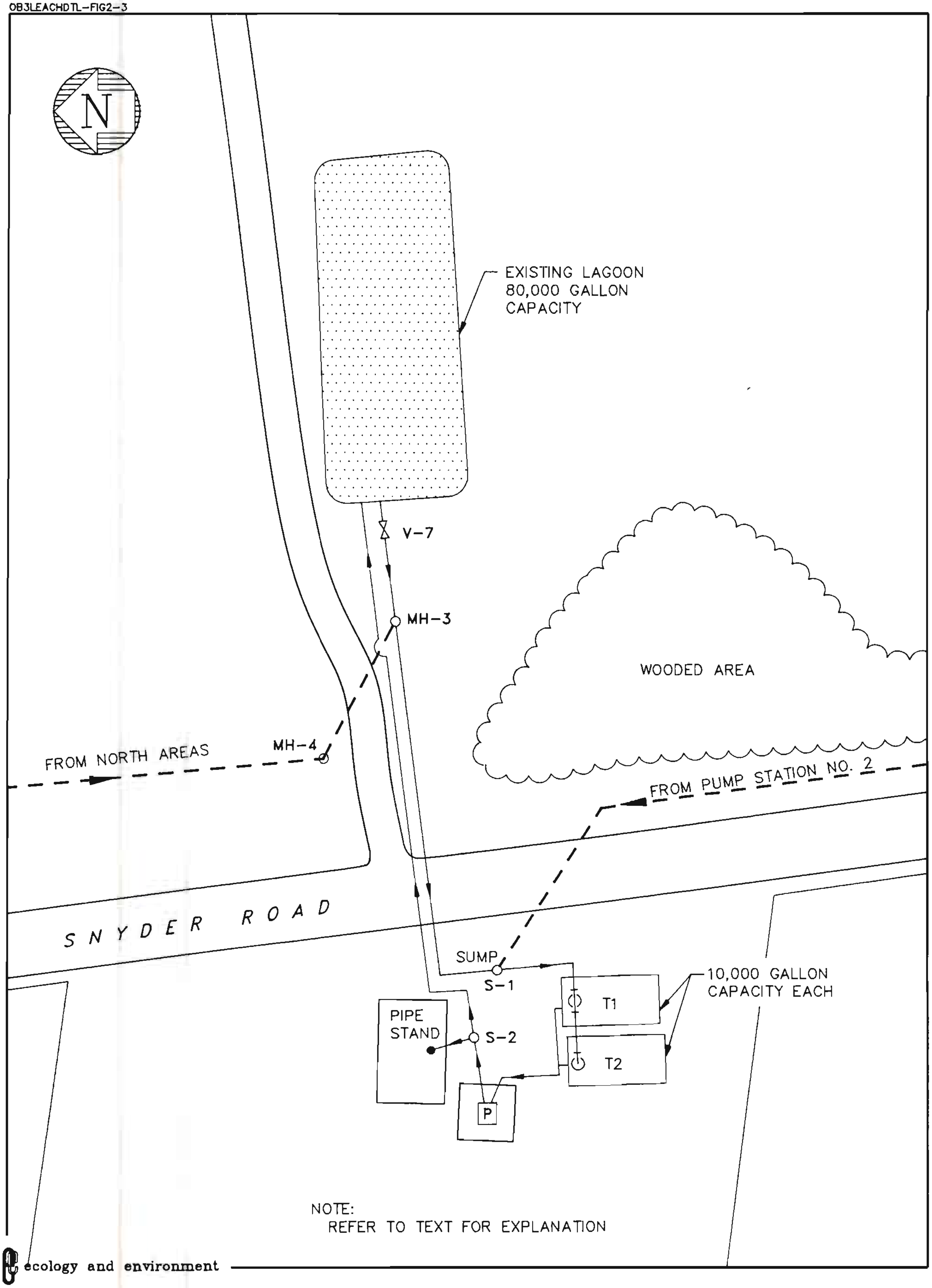


Figure 2-3 WELLSVILLE-ANDOVER LANDFILL
LEACHATE COLLECTION SYSTEM DETAIL

Total Calculated Leachate Generated	20.2 Mgal
Total Leachate Collected by Wellsville	8.8 Mgal
Total Estimated Overflowing to Surface Water	2.7 Mgal
Total Estimated Migrating to Groundwater	8.7 Mgal

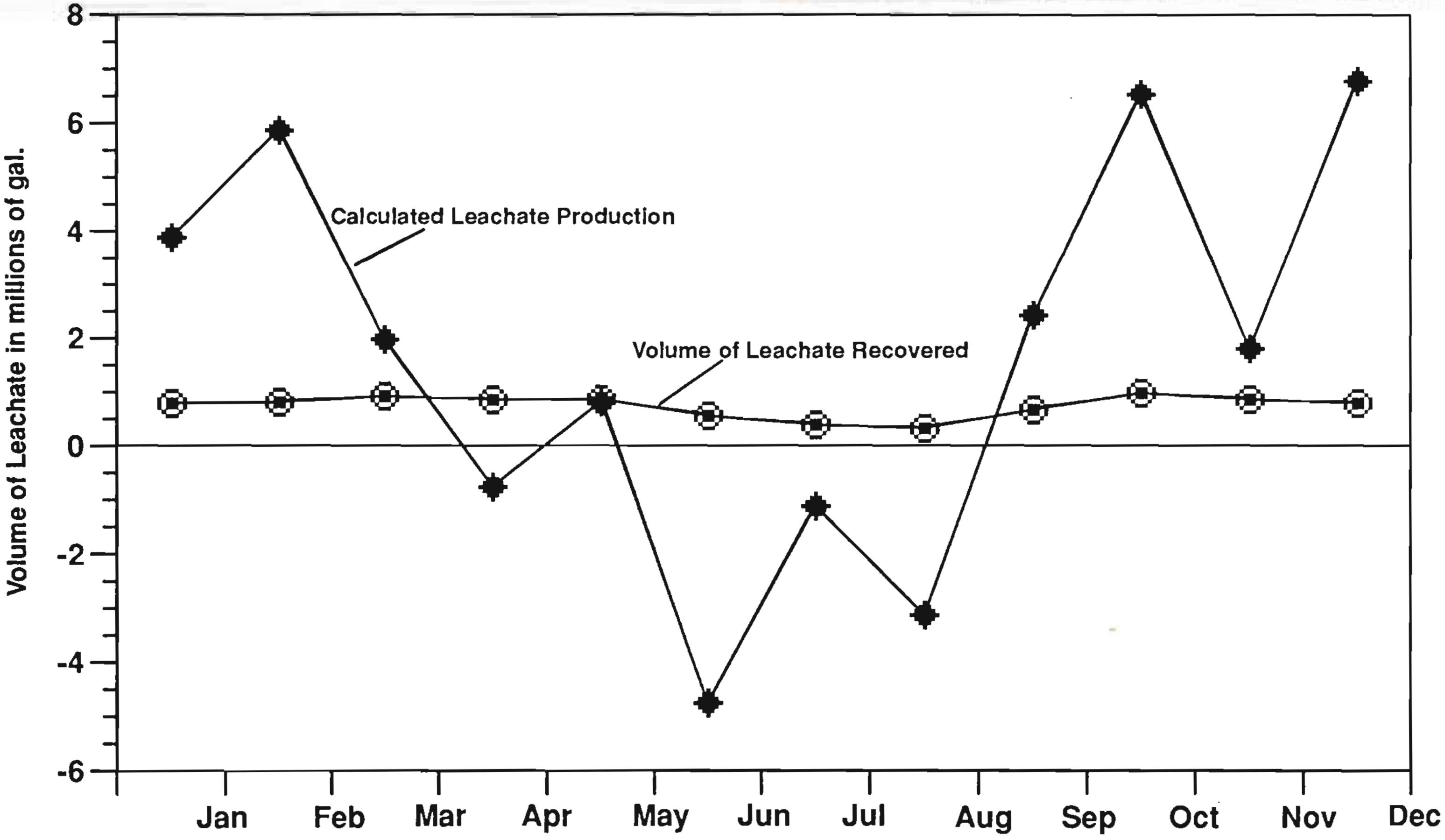


Figure 2-4
WELLSVILLE-ANDOVER LANDFILL
WATER BALANCE 1990

3. EVALUATION OF INTERIM ALTERNATIVES

The alternatives outlined below have been selected based on their applicability for reducing the impact of the Wellsville-Andover Landfill on human health and the environment. Since there is only a minor chance of direct contact with the waste materials, the development of PIRA alternatives concentrated on the leachate problems previously identified. The objectives stated below were used as a guideline for the evaluation of PIRAs.

Objectives

Based on the review and evaluation of the available data, the following PIRA objectives were developed:

- Reduce, control, and/or treat the leachate that is currently overflowing the existing LCS;
- Reduce the generation of leachate;
- Reduce the impact of leachate on the groundwater; and
- Reduce the potential for unauthorized site access.

These objectives are used as the basis for the development of PIRA alternatives for the site.

Phased Placement of a Final Cover. This alternative consists of the phased placement of a final cover (cap), which is required as a minimum by 6 NYCRR, Part 360 for landfill closures. The cap will most likely be a multiple layered type and include a gas venting layer, geosynthetic membrane barrier layer, a soil protection/drainage layer, and a topsoil layer. Placement of a final cap will reduce the surface infiltration into the landfill mass, thus reducing the leachate generation by at least 75%. Its effectiveness would depend heavily on the groundwater flow patterns.

Several conditions must be met prior to placement of the final cap. Among these, but not exclusively, are an accurate determination of the area boundaries in order to determine the areal extent of the cap; and the extent of groundwater inflow must be known to determine if there is a need to incorporate a groundwater control system into the cap design.

At present these conditions are not satisfied. The Phase I RI groundwater results have identified off-site migration of the leachate through the groundwater to the east and south. This finding requires further study because, prior to the RI, it was assumed that the direction of groundwater flow was to the southwest. Based on the findings of the Phase II RI, it may be necessary to move waste out of the path of groundwater flow or to divert the flow, if possible. In either case, the surface of the landfill areas will be disturbed, making the early implementation of a cap inappropriate.

Installation of Groundwater Cutoff Walls. This alternative measure is not appropriate at this time due to lack of data on groundwater flow. It will be further investigated upon completion of the Phase II RI.

Improvements to Surface Water Diversion Ditch Along the Northern Edge of the Landfill. The existing diversion ditches appear to be adequate. There was no evidence of surface runoff entering the landfill from upgradient areas.

Improving Operation and Maintenance of LCS. PS-2, which pumps leachate from southern cells to the holding tanks at PS-1, should be repaired. Based on field observations and conversations with site personnel, the pump does not work and leachate overflows continuously.

A second possibility is to provide an equalization facility at the village of Wellsville STP. This would reduce the impact of leachate on plant operations by providing a more constant flow to the plant for treatment and may allow the village plant to process more leachate.

The only other option identified as an operation and maintenance alternative is to increase the amount of leachate transported to and treated at the STP. However, discussions with STP personnel indicates that the treatment of the leachate currently creates minor problems at the plant. The STP has only enough storage to equalize leachate from the first truckload. Thereafter, leachate is unloaded rapidly and directly into the influent stream. The resultant slug load may cause some deterioration in treatment efficiency. However, the plant has consistently met discharge requirements.

The STP operator also indicated problems related to the staining properties of the leachate and limited plant sludge storage capacity in the winter. The operator believes the leachate creates a large quantity of sludge, primarily due to the high iron content. Sludge storage is required in winter because the village uses sludge drying beds to dewater sludge.

Improving or Increasing Leachate Storage Capacity. Construction of additional leachate storage at the landfill site would provide additional protection against overflow during periods of heavy leachate generation. Improved or increased leachate storage capacity may be applicable as a stand-alone alternative or in conjunction with hauling or treatment alternatives. The total storage capacity required would be determined based on a number of factors, including peak flow rates, durations of high flows, capacities of treatment alternatives, and revised hauling rates.

On-Site Leachate Treatment. Based on the data available, on-site treatment of the landfill leachate appears feasible. A treatment system including unit processes such as equalization, iron precipitation, biological treatment, clarification, holding, and sludge treatment would significantly reduce the oxygen demand and VOC content of the waste stream and, therefore, provide increased health, safety, and environmental protection. Presently, it is not possible to determine which unit processes will be required or to make a realistic estimate of the size of the various unit processes. The following factors have a significant effect on final selection and sizing determinations:

- **Leachate Concentrations and Quantity.** Preliminary estimates used in this report are based on very limited data and are used only to illustrate a point. Additional data will be required to size the various unit processes and to estimate sludge production if treatment is considered further.

- **Feasibility of additional leachate treatment at the Wellsville STP.** Investigation of this factor will effect the sizing of the various processes and even final treatment requirements. For example, the STP may be able to accept more leachate if a pre-treatment system is installed at the landfill site that significantly reduces the oxygen demand of the leachate or removes iron.

- **Feasibility of additional sludge treatment at the STP.** If it is possible to treat additional sludge at the STP, the number of treatment options increases. For example, an alternative that could be considered would include cessation of leachate hauling by the village, treatment of the leachate stream at the landfill and hauling and treatment of the sludge produced by the treatment process at the STP.

4. CONCLUSIONS AND RECOMMENDATIONS

Two factors are evident from the evaluation of the known and existing conditions at the landfill:

- The quantity of untreated leachate escaping from the LCS to the environment is much greater than originally estimated; and
- Additional data regarding leachate overflow quantity and quality is needed prior to the further evaluation of PIRA alternatives pertaining to the LCS.

Though there is a lack of data pertaining to the quality and quantity of leachate being produced, the available data indicate that there may be a significant problem that requires immediate attention due to leachate leaking from the LCS.

Furthermore, site access is relatively unrestricted and trespassers may be directly exposed to on-site contaminants.

The impact of leachate on the groundwater is also a concern. However, the two most effective solutions identified for mitigating this impact (i.e., a final cover and groundwater controls) are not easily implemented as an interim solution. These actions will likely be incorporated into a final, comprehensive remedial plan, pending results of the Phase II RI.

Therefore, the following interim actions are recommended:

1. Limit site access, especially in areas of increased risk such as the leachate storage pond;
2. Obtain additional data regarding the quantity and quality of leachate overflowing the LCS to determine the magnitude of the existing problem and provide a basis for the further evaluation of alternatives that would reduce the impact. Additional information that should be obtained includes:
    - Contaminant analyses on leachate for COD; BOD; total Kjeldahl nitrogen (TKN); pH; oil and grease; and suspended solids;

- Contaminant analysis on leachate for TCL parameters;
- Daily estimates of total leachate flow within the LCS; and
- The feasibility of transporting and/or treating additional leachate or sludge at the village of Wellsville STP.

In addition to those more immediate data needs, several questions will need to be answered during the Phase II RI in order to develop final remedial actions. These needs will be discussed in the Phase I FS report. ?

D R A F T

OB-3030 D3715

PHASE I REMEDIAL INVESTIGATION REPORT
WELLSVILLE-ANDOVER LANDFILL SITE
TOWNS OF WELLSVILLE AND ANDOVER
ALLEGHANY COUNTY, NEW YORK
SITE NUMBER 9-02-004

March 1992

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Prepared for:

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1. INTRODUCTION

1.1 PURPOSE OF REMEDIAL INVESTIGATION

Ecology and Environment Engineering, P.C. (E & E), under contract to the New York State Department of Environmental Conservation (NYSDEC), Division of Hazardous Waste Remediation (DHWR), was requested to perform a Remedial Investigation and Feasibility Study (RI/FS) at the Wellsville-Andover Landfill, site number 9-02-004, an inactive municipal landfill in the towns of Wellsville and Andover, Allegany County, New York. The objectives of the RI/FS, as outlined in this summary report, are to:

- Assess the cause, extent, and effects of the presence of hazardous materials in the project area;
- Identify and evaluate remedial alternatives selected to mitigate contamination problems that pose threats to the environment or to public health, as determined by the fieldwork and data evaluation conducted during the RI; and
- Recommend remedial alternatives.

The RI/FS specifications were formulated in accordance with criteria presented in the State Superfund Standby Contract (Work Assignment No. D002625-8).

1.2 SITE DESCRIPTION

The Wellsville-Andover Landfill site is located along the east side of Snyder Road (formerly Gorman Road) in a sparsely populated rural area of eastern Allegany County, New York (see Figure 1-1). The site straddles the border between the towns of Wellsville and Andover, with approximately the southern third in Wellsville and the northern two-thirds in Andover. The property owned by the Village of Wellsville is roughly rectangular in shape, measuring approximately 4,000 feet north-to-south by 1,500 feet east-to-west, for a total area of approximately 120 acres. The northernmost portion of the property, consisting of approximately 35 acres, has not been used for waste deposition and was not included in the site investigation.

The landfill is located on a hillside on the west side of Duffy Hollow with nearly 200 feet of relief from north to south. The north end of the property is on top of the hill at an approximate elevation of 2,230 feet above mean sea level (AMSL). This area is currently used by a local community group, the Wellsville Area Small Plane Society, for recreational purposes. Access to the undisturbed portion of the site is gained only by a central dirt road that runs north-south through the filled areas. The east side of the site is bounded by open fields and patches of mature beech/sugar maple forests and slopes downward to Duffy Creek at grades of 14% to 20%. Numerous permanent and seasonal residences exist along Duffy Creek approximately 1,400 to 1,500 feet east of the eastern border of the site. The southern border of the site is fenced with barbed wire and lies adjacent to fields often grazed by horses. The nearest residence south of the site is seasonal and located 600 feet to the southeast. Snyder Road borders the southern third of the site to the west. One permanent and one seasonal residence exist along the west side of Snyder Road within 300 feet of the landfill. The remainder of the west side is bounded by mature beech/sugar maple forests, with one seasonal residence located approximately 500 feet west of the site.

Approximately 1,500 feet east of the site is Duffy Creek, a Class C stream (6 NYCRR 821.6). An unnamed intermittent tributary to Duffy Creek begins along the west side of the site and flows south-southeast until it converges with Duffy Creek approximately 3,000 feet southeast of the site. Duffy Creek flows south, eventually joining Dyke Creek 1.8 miles south-southeast of the site. Dyke Creek, also a Class C stream, is a direct tributary of the Genesee River.

Numerous man-made containment ditches exist at the site for the purpose of diverting surface runoff from the filled areas. Surface water from the northeast area of the site is collected in a drainage collection pond in the center of the site. This pond, which contains water perennially, is designed with an overflow to allow excess water to drain via ditches toward Snyder Road. Surface water from other areas of the site generally flows to the south and west, eventually draining into a ditch along the east side of Snyder Road. A series of culverts then divert this water directly into the unnamed tributary west of the site.

1.3 SITE HISTORY

The following site history contains information and data from numerous sources, including the Phase I and Phase II reports, that have not been combined in a single document before.

The Wellsville-Andover Landfill was operated by the Village of Wellsville from 1964 until 1983. The site consists of four fill areas, as shown on Figure 1-2. The south, south-central, and northwest fill areas accepted municipal, industrial, and hazardous waste between 1964 and 1978. According to NYSDEC's 1983 Phase I Report, the Rochester Button Company of Wellsville, New York disposed of unknown quantities of methylene chloride (MC) and possible trichloroethene (TCE) at the site between 1960 and 1973. However, correspondence between the Rochester Button Company and the Village of Wellsville Department of Public Works (DPW) indicates that the waste stream reaching the landfill consisted of two phases, solid and sludge (Massey 1978). The solid portion reportedly consisted of polymerized polyester scraps, while typical sludge, composed of 65% solids, consisted of approximately 44% pumice, 22% polyester fines, 35% water, trace amounts of talc and detergent, and 0.04 ppm lead carbonate. The total amount of solid waste produced by the Rochester Button Company (including paper and office waste) was reportedly 481,500 tons per year (Massey 1978).

The northeast fill area, open from 1978 to 1983, accepted municipal and industrial solid waste similar to the solid wastes described above. As described in the Phase I report, other wastes disposed of at the landfill included plastics, sodium cyanide salt, cutting oils, chromium and zinc chromate paints, solvents, coolants, and lubricating oils (NYSDEC 1983).

In addition to the above wastes, the landfill also accepted water-soluble cutting oils from two Wellsville area heavy metal manufacturing plants, C.E. Air Preheater Company, Inc. and Turbodyne Division of McGraw-Edison (MacFarquhar 1973).

Of the four fill areas, only the northeast area had a leachate collection system installed prior to waste deposition. However, as was the case with the other three fill areas, no liner was installed beneath the waste. The three older areas were in operation prior to modern regulatory requirements for design and operation of landfills. Apparently, no accurate documentation of the location or construction of cells in these areas was recorded. The available information suggests that the trench method of landfill operation was used and that the depth of waste varies but probably is less than 14 feet below ground surface.

In 1986, the Village of Wellsville prepared a Phase II Superfund investigation report under an Order on Consent filed by NYSDEC in August 1985. As described in this Phase II report prepared by Malcolm Pirnie, the Village of Wellsville installed a leachate collection system along the west side and central portion of the site in 1984 and 1985 to curtail the off-site migration of leachate. The system consists of a series of perforated 6-inch polyvinyl chloride (PVC) pipes in trenches backfilled with number 2 round stone. The trenches were excavated to depths of approximately 9 to 14 feet, which was stated to be below the estimated depth of the fill material. The layout of the system was based on the assumed direction of local groundwater flow--that is, from north to southwest in the central and western portion of the landfill. As shown in Figure 1-2, one main collection line runs along the west side of the site, adjacent to the northwest fill area. This line is joined at the northern access gate by another main line, which runs along the east side of the northwest fill area and joins with the system installed in the northeast fill area. A separate main line was installed along the south side of the south fill area. Lateral lines with vertical risers at the terminal ends were extended from the main lines into areas displaying visible leachate seeps. Leachate collected in the northwest, northeast, and south-central fill areas flows by gravity to a sump adjacent to Pump Station 1 (see Figure 1-2). Leachate from the south fill area flows by gravity to Pump Station 2, consisting of a cistern with a submersible pump, where it is then pumped to the sump at Pump Station 1. Leachate from the sump is then stored in two 10,000-gallon holding tanks adjacent to Pump Station 1. An 80,000-gallon pond located on site near the southern access gate stores leachate that overflows from the two holding tanks. This unlined pond is rarely dry and shows evidence of having overflowed.

During E & E's site visit in February 1991, Pump Station 2 was full, and excess leachate was flowing off site to the south onto the property of Mr. D. LaDue.

Between July and December 1991, during the Phase I RI field work, E & E observed the conditions of the pump stations and pond. The excess-leachate holding pond was found to be full on numerous occasions, but no evidence of overflow from this pond was observed. During the dry mid- to late-summer months, the pond was often drained by the DPW, and no overflow from the sumps at either pump station was observed. During E & E's investigation, it was noted that the DPW drained the holding tanks at Pump Station 1 up to four times per day. The frequency of drainings was dependent upon the amount of leachate in the tanks and holding pond. Precipitation increased in September and October 1991, and during this time, leachate was observed overflowing from Pump Station 2 and migrating south onto Mr. LaDue's property.

In addition, during a site visit in February 1992, leachate was observed overflowing from Pump Station 2 as well as from the holding pond. Leachate overflow from the pond was followed and seen entering the unnamed stream west of the site.

The results of previous sampling programs at the site prior to 1986 were discussed in the Phase II investigation report prepared by Malcolm Pirnie for the Village of Wellsville in 1986. The sampling performed prior to the Phase II investigation concentrated on leachate, Duffy Hollow Creek, and residential wells in the vicinity of the landfill. The residential wells showed low-level cyanide and zinc contamination but at concentrations below NYSDEC Class GA standards. Duffy Hollow Creek samples showed low-level zinc contamination but at a concentration below NYSDEC Class C standards. Analyses of the leachate indicated the presence of phenol, cadmium, chromium, and lead. No analyses for toxic organic substances were performed. The accuracy of this reported data is questionable because appropriate NYSDEC Contract Laboratory Program (CLP) methods were not utilized.

NYSDEC sampled a number of private wells and springs in the vicinity of the Wellsville-Andover Landfill in 1984. The samples were tested for oil and grease, phenols, volatile organic contaminants (VOCs), and metals. Analytical results indicated that:

- Phenols were not detected in any of the samples;
- No metals were detected above NYSDEC Class GA groundwater quality standards;
- All samples were free from VOCs, with the exception of those collected from the LaDue spring, which contained 150 ppb of trans-1,2-dichloroethene (tDCE) and 9 ppb of TCE; and
- All of the samples, with the exception of those collected from the LaDue spring, showed low levels of oil and grease contamination.

VOC results of this sampling effort are presented in Table 1-1, along with Allegany County Department of Health (ACDOH) sampling results for residential water supplies in the area. Figure 1-3 depicts the approximate residential well and spring locations sampled between 1984 and 1989.

NYSDEC again sampled a number of residential water supplies in August 1987. The results of this sampling effort, which are included in Table 1-1, indicate the following:

- The Miller spring contained 20 μg/L tDCE and 15 μg/L TCE; and
- The LaDue spring contained 40 μg/L tDCE and 23 μg/L TCE.

As summarized in Table 1-1, ACDOH has sampled numerous residential water supplies in the vicinity of the site. The only locations found to contain VOCs were the LaDue and Miller springs, as follows:

- In April 1985, the LaDue spring contained 67 μg/L tDCE, 16 μg/L TCE, and 20 μg/L benzene;
- In May 1989, the LaDue spring contained 17 μg/L of cis-1,2-dichloroethene (cDCE) and 14 μg/L TCE;
- In December 1989, the LaDue spring contained 18 μg/L tDCE, 10 μg/L TCE, and 1 μg/L bromodichloromethane (a trihalomethane); and
- In December 1989, the Miller spring contained 2 μg/L cDCE and 1 μg/L of TCE.

Sampling performed by Malcolm Pirnie in 1986 during the Phase II investigation included analyses of leachate, groundwater, residential well and spring water, surface water, and sediment. The leachate, groundwater, and residential water supplies were analyzed for priority pollutant metals (unfiltered), organic substances, cyanide, pH, and conductivity. The surface waters were analyzed for the same five constituents as well as temperature and dissolved oxygen. Sediment samples were analyzed for priority pollutant metals, organic substances, and cyanide. Tables 1-2 and 1-3 summarize the residential water, groundwater, and leachate sampling results. A summary of the results is as follows:

- The presence of cyanide or chromium at the significantly elevated levels indicated by the Phase I investigation was not confirmed in the various media sampled.
- Seven VOCs were detected in the leachate, including MC, acetone, vinyl chloride (VC), tDCE, 2-butanone, toluene, and ethyl benzene. Cadmium and manganese were also detected at elevated levels in the leachate.
- Two of the three downgradient groundwater monitoring well samples exhibited elevated levels of acetone and/or MC. In addition, one groundwater sample exhibited an elevated pH value. One potable residential water source (the LaDue spring) contained tDCE and TCE at levels exceeding NYSDEC Class GA standards. The Miller spring, which is not a source of potable water, contained MC, tDCE, and TCE at concentrations above regulatory levels.
- Iron was detected above the NYSDEC Class GA standard in the upgradient seep and downgradient groundwater, residential well, and spring water samples. Manganese was detected above the Class GA standard in downgradient groundwater, residential well water, and leachate samples. Sodium was detected above the NYSDEC Class GA standard in the groundwater and leachate samples but not in the residential water supply samples. No other metals were detected in excess of Class GA standards.
- Iron was detected at levels above the Class C surface water standard in the on-site drainage pond and Duffy Hollow Creek downstream samples.

Table 1-1

ACDOH AND NYSDEC
RESIDENTIAL WATER SUPPLY VOC SAMPLING RESULTS

Name	Date	Organic Compounds Detected (μg/L)				
		cDCE	tDCE	TCE	THM	Benzene
Baker[a]	05-01-89[c] 08-05-87[b]	--	--	--	--	--
Bauer	11-14-84[b]	--	--	--	--	--
Fanton	11-14-84[b]	--	--	--	--	--
Gephart	12-03-89[c]	--	--	--	1	--
Green	11-14-84[b]	--	--	--	--	--
Kelly, Jr.	11-14-84[b]	--	--	--	--	--
LaDue	12-03-89[c] 05-01-89[c] 08-05-87[b] 04-30-85[c] 11-14-84[b]	-- 17 -- -- --	18 -- 40 67 150	10 14 23 16 9	1 -- -- -- --	-- -- -- 20 --
Miller	12-04-89[c] 08-05-87[b]	2 --	-- 20	1 15	-- --	-- --
Ormsby	05-01-89[c]	--	--	--	--	--
Rosini	05-01-89[c] 11-14-84[b]	-- --	-- --	-- --	-- --	-- --
Teller	05-01-89[c] 11-14-84[b]	-- --	-- --	-- --	-- --	-- --

[a] Former Fitzgibbon residence.
[b] Sampled by NYSDEC.
[c] Sampled by ACDOH.

Key:

cDCE = cis-1,2-Dichloroethene.
tDCE = trans-1,2-Dichloroethene.
TCE = Trichloroethene.
THM = Total trihalomathanes.
NA = Not analyzed.

Sources: Vossler 1989a, 1989b, 1989c, 1989d, 1989e, 1990a, 1990b, and 1990c; Clare 1987; and Bates 1986.

Table 1-2

PHASE II INVESTIGATION[a]
GROUNDWATER AND LEACHATE SAMPLING RESULTS
(JUNE 1986)

Sample	Organic Compounds Detected (μg/L)								Inorganics Above Standards[b] (μg/L)			
	VC	MC	Acet	tDCE	2-But	Tol	EB	TCE	Cd	Fe	Mn	Na
Groundwater												
3B	--	19	470	--	--	--	--	--	--	17,400	707	25,600
4A	--	--	5,100	--	--	--	--	--	--	10,200	4,240	20,900
4B	--	--	--	--	--	--	--	--	--	18,500	4,110	45,500
Leachate												
Trench	670	--	--	1,400	--	--	--	--	--	914	689	--
Sump	--	J	2,100	8,300	3,200	540	950	--	47	529	22,900	135,000

[a] Malcolm Pirnie 1986.
[b] Indicates only those inorganic analytes detected above NYSDEC Class GA standards per 6 NYCRR Part 701.

Key:

VC = Vinyl chloride.
MC = Methylene chloride.
Acet = Acetone.
tDCE = trans-1,2-Dichloroethene.
2-But = 2-Butanone.
Tol = Toluene.
EB = Ethylbenzene.
TCE = Trichloroethene.
J = Detected below sample quantitation limit.

Source: Village of Wellsville 1986.

Table 1-3

PHASE II INVESTIGATION[a] RESIDENTIAL WATER SUPPLY SAMPLING RESULTS (JUNE 1986)

Name	Organic Compounds Detected (μg/L)						Inorganics above MCLs[b] (μg/L)	
	MC	tDCE	TCE	DEP	Phenol	4MP	Iron	Manganese
Fitzgibbon	--	--	--	--	--	--	--	--
Kelly	--	--	--	--	--	--	--	--
LaDue	--	72	34	--	--	--	--	--
Miller	24	32	21	J	J	1,900	1,130	--
Rosini	--	--	--	--	--	--	650	508
Teller	22	--	--	--	--	--	--	--

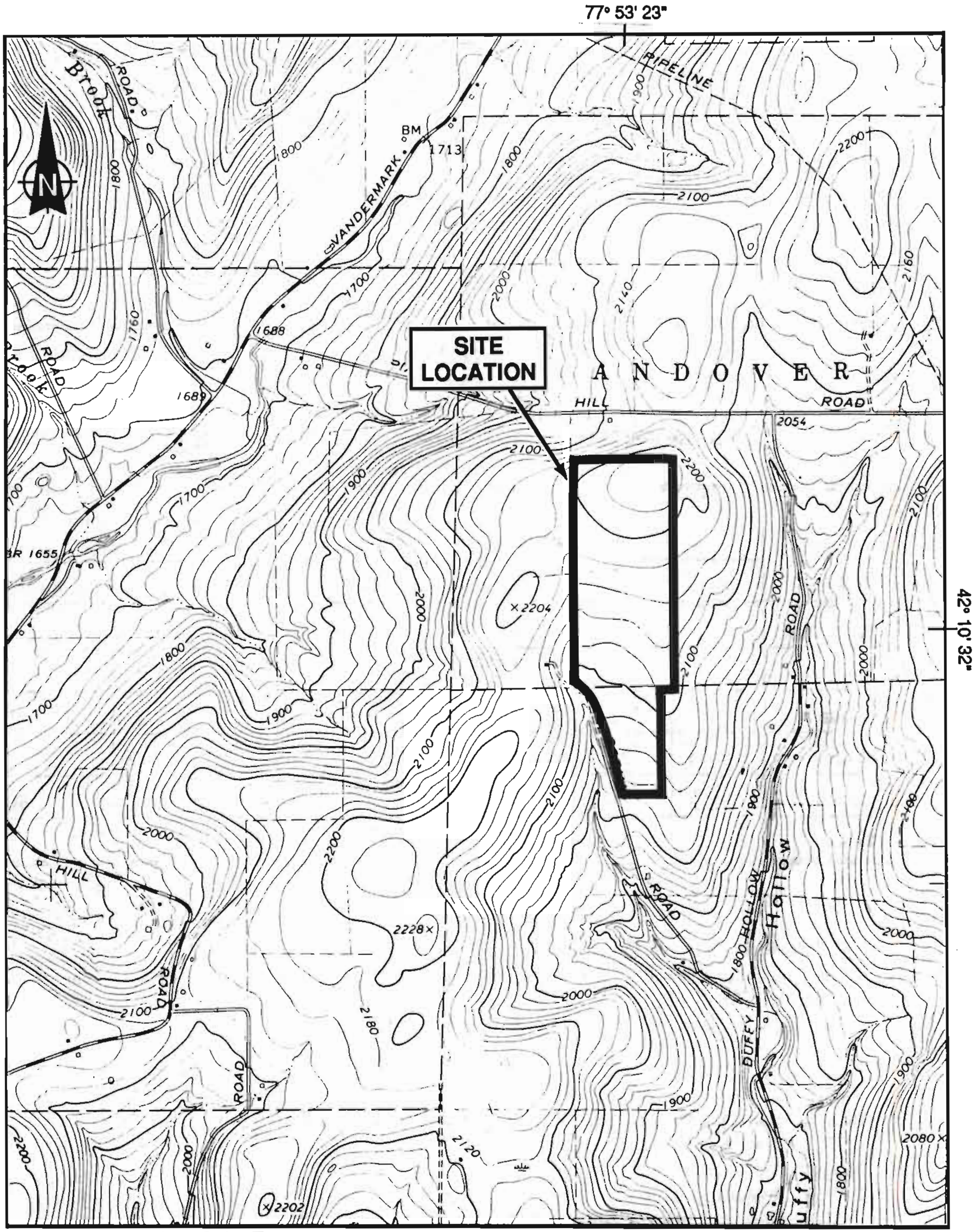
[a] Performed by Malcom Pirnie in 1986.

[b] Indicates only those inorganic analytes detected above Maximum Contaminant Levels (MCLs) per 10 NYCRR Subpart 5-1.

Key:

MC = Methylene chloride.
tDCE = trans-1,2-Dichloroethene.
TCE = Trichloroethene.
DEP = Diethylphthalate.
4MP = 4-Methylphenol.
J = Detected below sample quantitation limit.

Source: Village of Wellsville 1986.



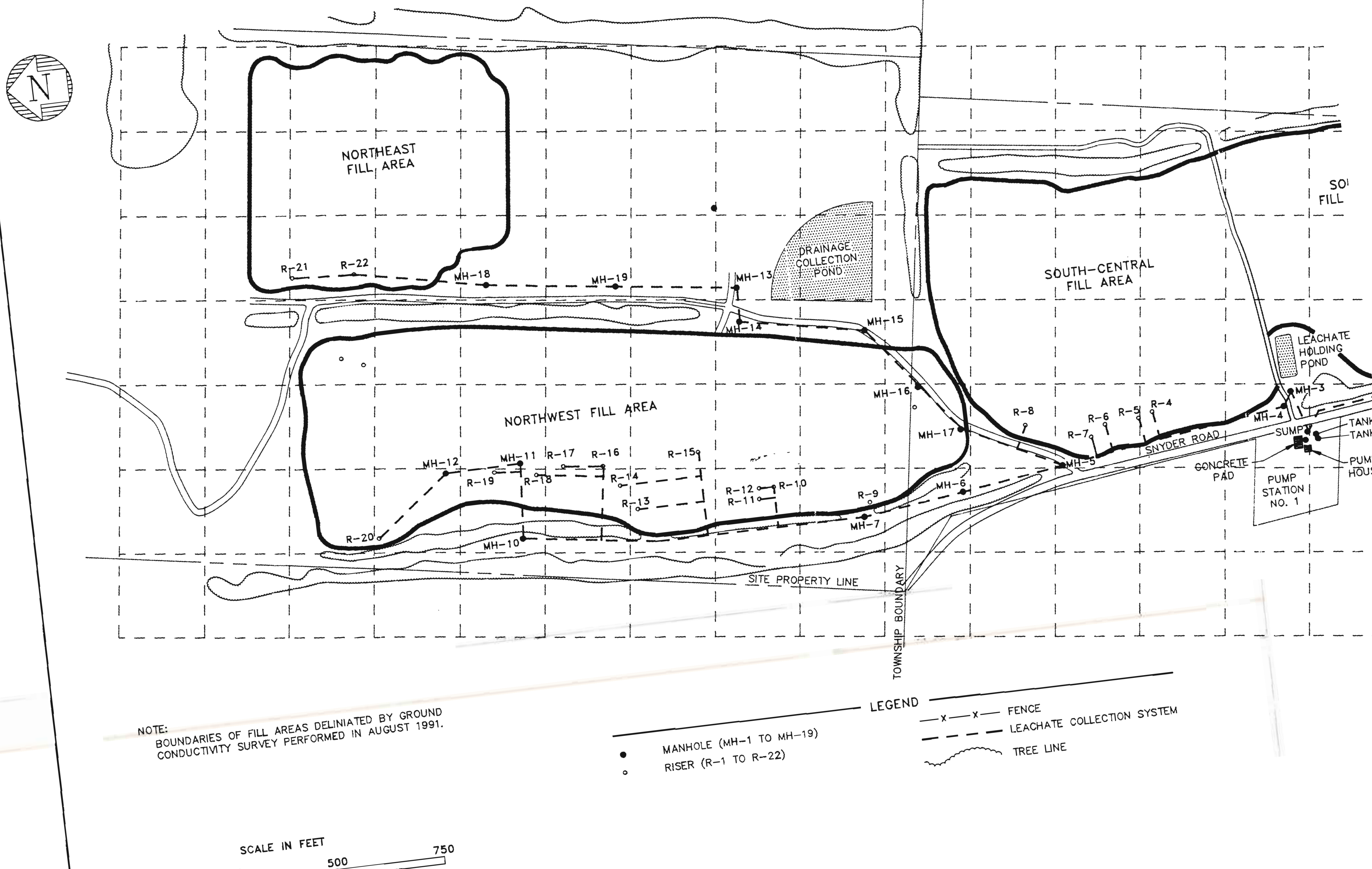
SOURCE: USGS 7.5 Minute Series (Topographic) Quadrangle, Wellsville North, NY 1965.

SCALE 1:24,000

0 ½ 1 Mile

0 .5 1 Kilometer

Figure 1-1
SITE LOCATION MAP, WELLSVILLE-ANDOVER LANDFILL



NOTE:
BOUNDARIES OF FILL AREAS DELINIATED BY GROUND CONDUCTIVITY SURVEY PERFORMED IN AUGUST 1991.

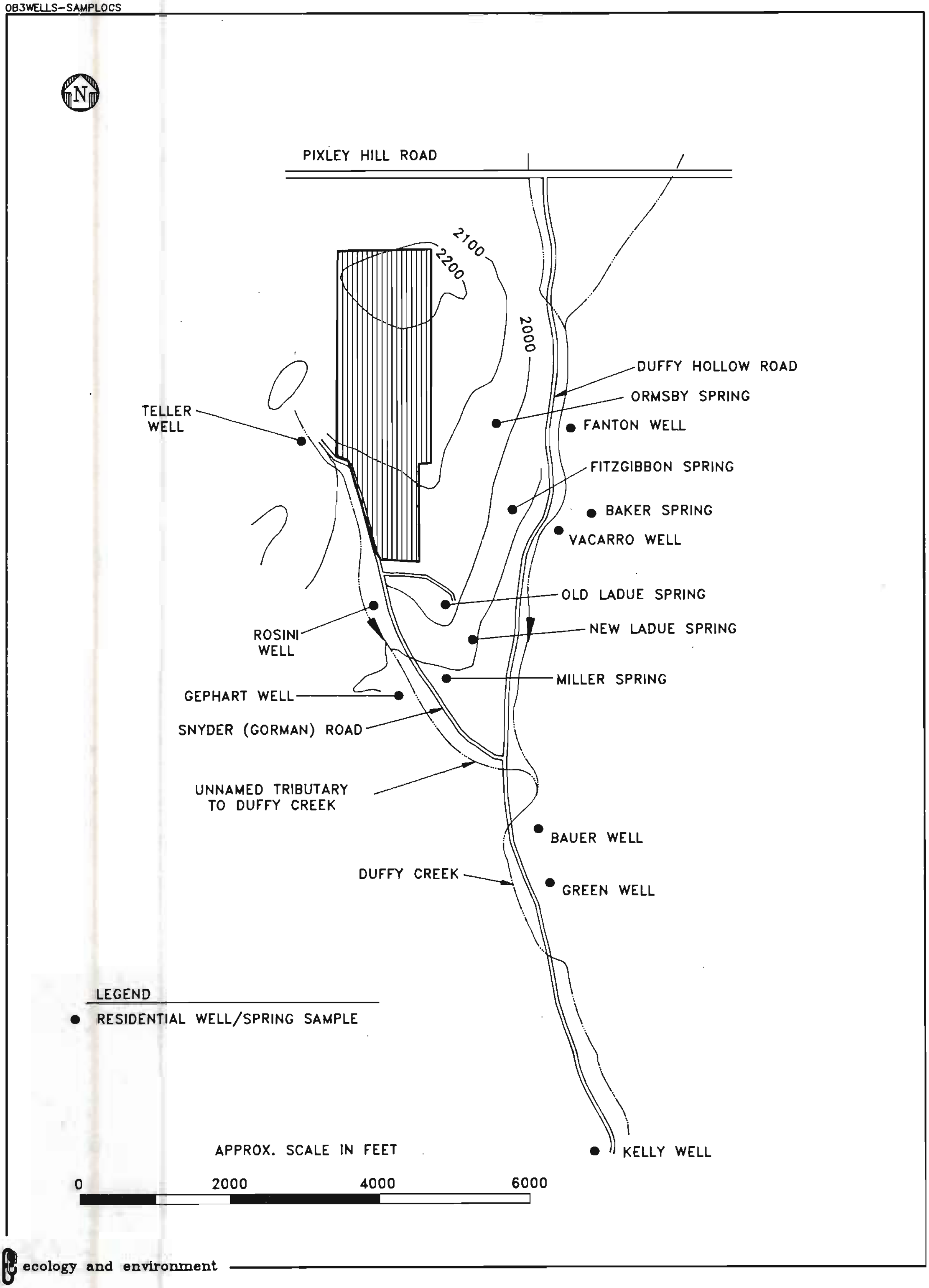


Figure 1-3 RESIDENTIAL WELL AND SPRING SAMPLE LOCATIONS, 1984-1989

2. ENVIRONMENTAL SETTING

2.1 INTRODUCTION

This section discusses the physical setting of the Wellsville-Andover area to provide a framework for a detailed discussion of the Wellsville-Andover Landfill site. Specific discussions regarding site characteristics (i.e., geology, topography, hydrology, and hydrogeology) are presented in Section 4.

2.2 PHYSIOGRAPHY AND TOPOGRAPHY

Wellsville is located in southeast Allegany County in the southern tier of New York State. The area is part of the Allegheny Plateau region of the Appalachian physiographic province (Woodruff 1942) and is characterized by a mature, medium-textured upland of moderate relief developed on sedimentary rocks with a gentle southward regional dip (Muller 1957). All of Allegany County was affected by moderate glaciation during two or more episodes of the Pleistocene Epoch and therefore contains the characteristic open valleys, glacially scoured summits, and drift deposits of the southern New York section of the Appalachian province (Muller 1957).

Allegany County includes some of the most rugged topography in Western New York, with a maximum relief of 1,400 feet. Average local relief is approximately 600 to 800 feet. The highest elevation in the area is Alma Hill near Belmont, New York, with a summit elevation of 2,548 feet AMSL. The lowest elevation in Allegany County is where the Genesee River crosses into Wyoming County at an elevation of less than 1,120 feet AMSL (Muller 1957 and Woodruff 1942).

While glacial history has played an important role in the topographic development of the area, the underlying Paleozoic strata also influence topography. Interbedded shales, sandstones, and conglomerates produce scarplets and benches in many areas with relatively erosion-resistant caprock of sandstone and conglomerate.

2.3 REGIONAL GEOLOGY

2.3.1 Soils

The following discussion of the regional soil types is based primarily on the soil survey for Allegany County prepared by the United States Department of Agriculture (USDA) in 1956.

The soils in Allegany County are derived from a variety of glacial materials, creating the large variation of soil types throughout the county. The soils identified by USDA on or adjacent to the site include members of the Bath, Freemont, Lordstown, Mardin, and Volusia series. These soils range from level or gently sloping to hilly and moderately steep, are found in upland areas, and range from well-drained to poorly and imperfectly drained.

A large portion of the landfill site is composed of Volusia channery silt loam. Volusia soils are the most extensive in the county. In general, they are characterized by high acidity and poor drainage, occur on gentle slopes, and may receive seepage water from higher lying areas. Volusia soils have a gray-brown surface horizon underlain by a light-colored horizon that is periodically saturated. Below this lies a mottled zone underlain by a very firm hardpan. This hardpan restricts permeability, causing increased runoff and, consequently, increased erosion.

Freemont soils are found in relatively level to gently sloping areas near the high plateau. The soil is described as a yellow-brown silt loam with a mottled layer below 7 to 10 inches, indicating the presence of water at this depth periodically. Hardpan occurs at a depth of 18 inches. Freemont soils are imperfectly drained and grade into the poorly drained Volusia. In some locations, the two soils cannot be distinguished.

Lordstown soils are shallow to moderately deep, strongly acidic, well-drained, and have a bright yellow-brown subsoil. The soil contains flat stone fragments throughout, derived locally from weathered sandstone and shale. These soils are commonly found in areas with strongly sloping terrains. Bedrock generally occurs at depths between 18 and 30 inches.

Mardin soils are strongly acidic and moderately well drained. These soils occur on uniform slopes ranging from gently sloping to steep and formed from glacial till consisting mainly of sandstone and shale. The surface soil is almost black with an underlying bright yellow-brown subsoil. A mottled horizon exists at about 14 inches, and the underlying hardpan is compact enough to restrict the downward movement of groundwater.

Prior to filling, the northwest and northeast portions of the site were composed mainly of Volusia channery silt loam. These portions also included small areas of Lordstown flaggy silt loam and Freemont and Mardin channery silt loams. These soil types are described above.

The south-central fill area was composed chiefly of Volusia channery silt loam with small areas of Lordstown flaggy silt loam, Mardin channery silt loam, and Bath channery loam. The Bath soils are yellow-brown, strongly acidic, deep, and well drained. These soils generally occur on the highest hills of the county at elevations of 2,000 to 2,500 feet. They were derived from glacial till and contain a high percentage of thinly bedded sandstone and shale fragments.

The soils in the vicinity of the south fill area included Mardin channery silt loam, Lordstown flaggy silt loam, and Bath Channery silt loam, all of which have been described previously.

2.3.2 Bedrock

The Late Devonian strata of the Wellsville area are some of the least understood in the New York Devonian sequence. Different group and formation names as well as different time relationships have been used by different authors. The majority of the following discussion is based on the works of Woodruff 1942, Rickard 1957, and Rickard 1975, using the names and temporal relationships described by Rickard 1975.

The stratigraphic section exposed in Allegany County consists primarily of interbedded shale and sandstone, with numerous locally conspicuous conglomerate layers in the upper portion of the column. While the majority of the county consists of Upper Devonian formations, the strata became progressively younger to the south, and outcrops of Mississippian units and Pennsylvanian conglomerate can be found near the New York-Pennsylvania state line. Regional dip is to the south at a fraction of a degree; however, the strata have been warped into open fields with anti- and synclinal axes trending northeast-southwest. This gentle folding causes local variation and reversal of dip (Woodruff 1942).

The Upper Devonian strata of Allegany County represent lateral facies changes that occurred during deposition of the Catskill Delta. As the Catskill mountains shed debris westward into a shallow sea, a progression of depositional environments developed from east to west across New York State. Deep depositional environments occur to the west and near the bottom of the stratigraphic section. Shallow depositional environments occur to the east and near the top of the section. As the basin filled and the sea regressed, progressively shallower type sediments were deposited in the Wellsville area.

In the Wellsville area, the base of the Upper Devonian section is formed by the Genesee and Sonyea groups (see Figure 2-1). These groups consist primarily of shales including the Geneseo, Penn Yan, West River, Middlesex, and Cashagua formations. These groups represent deposition in a relatively deep, anaerobic, distal basin. Above the Sonyea Group is the West Falls Group. At the base of the West Falls is the Rhinestreet Shale, which was deposited in an environment similar to that of the Genesee and Sonyea groups. Above the Rhinestreet, but within the West Falls Group, are numerous formations consisting of shale, siltstone, and sandstone representing deposition in a proximal basin and on an open shelf well below the wave base (Rickard 1975).

Atop the West Falls Group is the Canadaway Group. At the base of this group is the Hume shale, a dark gray to black shale. The Hume is considered the base of the Dunkirk Shale, which is prominent west of Wellsville. Above the Hume is the Caneadea Shale, which extends upward to the base of the Rushford Sandstone. The Caneadea consists of gray, silty shales and gray siltstones. The Hume and Caneadea were deposited under conditions similar to that of the upper West Falls Group. The upper part of the Canadaway Group is dominated by the interbedded shales, siltstones, and sandstones of the Wellsville and Whitesville formations. Originally thought to be two distinct units separated by a sandstone unit (Woodruff 1942), both formations are now considered the same and are thought to represent lateral facies changes (Rickard 1975). The Wellsville-Andover Landfill site is underlain by these units. Originally thought to be above the Cuba Sandstone (Woodruff 1942), the Wellsville and Whitesville formations are now believed to lie beneath the Cuba Sandstone (Rickard 1975). The Cuba, which marks the top of the Canadaway Group, consists of gray siltstones and fine-grained sandstones. The Wellsville and Cuba formations include material deposited in a diverse subtidal shelf (includes prodelta, delta front sands, and delta platform) and in the nearshore zone (e.g., distributary mouth bars, channels, estuaries, tidal flats, swamps, and marshes). The Whitesville represents peritidal deposits--i.e., cyclic interbeds of marine and non-marine deposits (Rickard 1975).

Above the Cuba is the Conneaut Group. This group consists of reddish shales interbedded with greenish-gray sandstones and may be part of the Germania Formation of Woodruff (1942) or part of the Cattaraugus Formation of Rickard (1975). Like the Whitesville, the Conneaut Group represents peritidal deposits (Rickard 1975).

Above the Conneaut Group, the Wolf Creek conglomerate forms the base of the Conewango Group. The lower part of the Conewango, especially to the west, consists of the interbedded red and green shales and greenish-gray sandstones of the Cattaraugus Formation. Above the Cattaraugus are the upper Sunfish shales and sandstones. The Cattaraugus, like the Whitesville, represents peritidal deposits, while the Sunfish consists of piedmont and alluvial floodplain deposits (Rickard 1975).

The site is underlain by the Wellsville and/or Whitesville formations of the upper Canadaway Group. Older formations from the lower Canadaway Group are exposed west and northwest of the site in the Genesee River and Vandermark Creek. Small areas of the younger Conewango Group are still exposed on hilltops south of Dyke Creek (Rickard and Fisher 1970).

The nearest known fault to the site exists approximately 7 miles to the southeast and is of an undetermined nature. Additionally, three topographic linear features have been observed on high altitude photographs. One is more than 25 miles long and trends northwest-southeast through the center of the Village of Wellsville. Another is approximately 3.5 miles long and trends northeast-southwest along Dyke Creek. The third is approximately 2 miles long and trends northwest-southeast joining the second feature where Dyke Creek enters the village (Isachsen and McKendree 1977).

Two pervasive joint sets have been mapped in the Wellsville area. One set of unspecified prominence with vertical and subvertical planes trends N20°W/S20°E. The second set, also of unspecified prominence, trends N29°W/S29°E (dip not given) (Isachsen and McKendree 1977).

2.4 REGIONAL HYDROLOGY

The Wellsville-Andover Landfill is located within the Genesee River Basin. The basin extends from the mouth of the Genesee River at Lake Ontario to northern Pennsylvania and has a total drainage area of 2,480 square miles (NYSWRC 1966). This section summarizes the hydrologic features of this basin in order to provide a framework for the discussion of the site hydrology presented in Section 4.

2.4.1 Surface Water

The Genesee River drains three-fourths of Allegany County. The river enters the county in the southeast, generally flows north, and exits the county to the north. A small southeastern portion of the county is drained by the Allegheny River, which flows south. Surface waters of the northeastern part of the county drain through tributaries of the Canisteo River into the Susquehanna River system, and surface waters from the northwestern corner of Allegany County drain into Lake Erie (USDA 1956). The Wellsville area is part of the Genesee River drainage basin. The major tributary streams to the Genesee River are Cryder, Dyke, and Angelica creeks east of the river and VanCampen, Black, and Caneadea creeks to the west. The principal lakes in the Genesee basin are the Little Finger Lakes: Conesus, Honeoye, Canadice, and Hemlock (NYSWRC 1966).

Springs, both intermittent and continuous, are common throughout the county. In upland areas, the underlying bedrock is close to the surface and is generally covered by glacial till with very low permeability. Water seeps downslope above the till layer and often comes to the surface as springs in wet seasons. If the impermeable layer is deep, permanent springs may be present (USDA 1956).

The Village of Wellsville relies on the Genesee River as its potable water source, while most residents outside the village rely on groundwater wells and/or springs.

2.4.2 Groundwater

Within Allegany County, water is found in both the overburden and the bedrock. Most of the unconsolidated sediments were deposited during glaciation. Low-lying areas were flooded and filled with sediments ranging from clays to coarse gravel. In the upland areas, till is the most common overburden material.

The greatest potential for groundwater exists in unconsolidated glacial outwash deposits in partially buried valleys in the central portions of the Genesee River drainage basin. In the northern portion of the basin, groundwater occurs at shallow depths but is highly mineralized (NYSWRC 1966).

The thick deposits of sand and gravel outwash contain little silt and clay and, therefore, are the most permeable water-bearing units. Recharge to these areas tends to be high due to their location in valley bottoms. Outwash deposits can supply sufficient quantities of groundwater for municipal and industrial use (Frimpter 1974).

Deposits in the upland areas are generally composed of till. Due to large variations in composition ranging from clays to gravels, tills tend to have low permeability and do not yield large quantities of groundwater. However, wells completed in till are sometimes adequate for domestic water supplies (Frimpter 1974).

Glacial deposits of clay and silt have low permeabilities and may confine underlying or perch overlying water-bearing deposits. Moraine deposits, where present, often lie above the water table. Where these moraine deposits are saturated, sand and gravel lenses within the deposits are capable of yielding sufficient water supplies for domestic use (Frimpter 1974).

Wells completed in the shale, siltstone, and sandstone bedrock of the area yield dependable supplies of groundwater for domestic or farm use. The quantity of groundwater is dependent on the occurrence of joints, fractures, and other secondary porosity characteristics of the bedrock. Wells are more likely to intercept and receive water from horizontal joints and fractures than vertical joints and fractures. However, vertical joints and fractures may act as conduits to recharge deeper portions of the aquifer (Frimpter 1974).

2.5 CLIMATOLOGY

Allegany County has a continental climate characterized by fairly high summer daytime temperatures and cool summer nights. Winters are usually long and severe. The hill and valley topography of the county causes many local variations in precipitation, temperature, and wind patterns.

The average yearly temperature is about 45° F, with a mean summer temperature of 66° F and a mean winter temperature of 24° F. Summer daytime temperatures have been as high as 98° F, and it has been as cold as -38° F in winter. Relative humidity in summer is relatively low, with only occasional intrusion of humid air. Thus, few sultry days occur.

The annual average rainfall is 35 inches; annual snowfall averages 64 inches. Precipitation is rather evenly distributed throughout the year. When precipitation occurs, it falls in a long, steady manner, rather than in torrential downpours. Flash floods are rare for the area. The driest year recorded only 22 inches of rain, while the wettest year had 54 inches.

Prevailing winds are from the west; however, local variations in wind speed and direction can occur due to topography, especially during fair-weather, light-wind conditions. Destructive wind velocities are rare, but the area does experience severe thunderstorms during the late spring and early summer months.

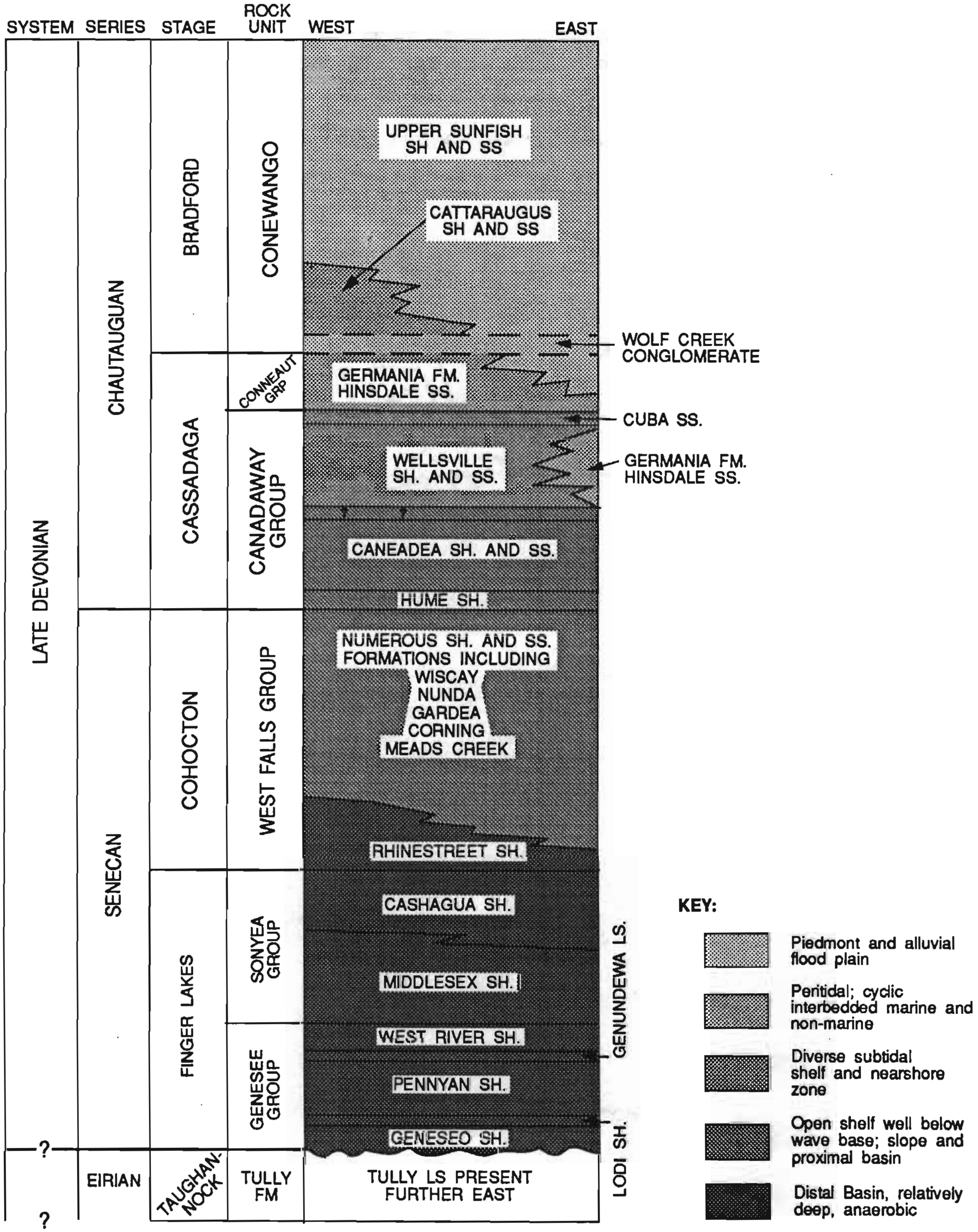


Figure 2-1
STRATIGRAPHIC CORRELATION CHART
FOR THE WELLSVILLE AREA

3. SITE INVESTIGATION METHODOLOGY

3.1 INTRODUCTION

Field investigation activities were performed on and adjacent to the Wellsville-Andover Landfill site between July 15, 1991 and February 27, 1992. The primary objectives of the field investigation were to:

- Determine the nature of on-site contamination;
- Determine the geologic and hydrogeologic characteristics of the site that may affect contaminant migration; and
- Assess possible contaminant migration off site.

The field tasks that were performed in order to complete these objectives were as follows:

- Base map development;
- Geophysical surveys (total earth field magnetics, ground conductivity, and seismic refraction);
- Trench excavation;
- Monitoring well installation (including description of the overburden and upper bedrock geology);
- Subsurface soil sampling;
- Groundwater sampling;
- Residential well and spring sampling;
- Surface water and sediment sampling;
- Surface soil sampling;
- Leachate sampling;
- Air sampling;

- Leachate collection system evaluation; and
- Habitat-based ecological assessment.

All samples collected during the Wellsville-Andover Landfill RI/FS were subject to the analytical protocols of the NYSDEC Contract Laboratory Program (CLP) as defined in the Analytical Services Protocol (ASP) of September 1989. All analyses were performed by E & E's Analytical Services Center (ASC), with the exception of the air and geotechnical analyses. Air samples were analyzed by Method TO-14 by Air Toxics, Ltd., and geotechnical analyses were performed by GZA GeoEnvironmental of New York, in Cheektowaga, New York. A summary of the analytical methods employed appears in Table 3-1. Field and laboratory quality assurance (QA) and quality control (QC) procedures are discussed in the Quality Assurance Project Plan (QAPjP) prepared by E & E for the site (provided under separate cover).

3.2 BASE MAP DEVELOPMENT

A base map of the site was developed to delineate the locations of man-made on-site structures, site topographic features, and sampling points within the site. Initial surveying was completed in July 1991. Surveying of on-site buildings, roads, manholes, etc. and the establishment of a 200-foot by 200-foot grid system were accomplished during the initial site survey. The final site survey, which was completed in November 1991, consisted of surveying the locations of all on-site sampling points, surveying the elevation and location of all monitoring wells, and surveying the elevation of the leachate collection system. All elevations were vertically surveyed to within 0.05 foot, and all locations were horizontally surveyed to within 1 foot.

In order to supplement ground-based data collected at the site, an aerial photograph was taken on March 4, 1992. Data derived from this photograph were used in conjunction with the ground survey during the development of the base maps used in this report.

As recommended and approved by NYSDEC, the use of infrared sensing techniques during aerial photography was deemed unnecessary at this time and not performed during the Phase I RI.

3.3 GEOPHYSICAL INVESTIGATION

The geophysical investigation program was designed to accomplish several objectives:

- To locate and delineate the boundaries of subsurface, ferrous objects of concern (e.g., 55-gallon drums);
- To define waste disposal areas and, if possible, delineate the cells within the disposal areas;

- To detect and define the boundary of potential groundwater contaminant plumes containing conductive heavy metals;

- To determine the depth to, and morphology of, the bedrock surface and delineate subsurface stratigraphy; and

- To assist in the selection of monitoring well locations.

Three surface geophysical surveying techniques were selected to accomplish the preceding goals: total earth field magnetics, electromagnetic ground conductivity, and seismic refraction.

A grid system was established over the site during the initial survey in July 1991. Transect lines trending north-south and east-west were surveyed with a node spacing of 200 feet. Within this surveyed grid, geophysical survey data points were located on a 40-foot north-south by 20-foot east-west grid system.

Data collected in the unfilled area north of the containment ditch are considered representative of background conditions and have been used for comparison with data collected in filled and disturbed areas.

3.3.1 Total Earth Field Magnetics

Total earth field magnetic data were collected with an EG&G model G856 magnetometer. The magnetometer was used to delineate subsurface ferrous objects and screen monitoring well locations prior to drilling. Data were collected every 20 feet along east-west transects spaced 40 feet north to south as described above.

In order to correct for diurnal variations in the earth's magnetic field, periodic readings were made at a single background location. Due to the vast extent of the survey area, it was impractical to periodically return to the same background location. Therefore, a second G856 magnetometer was employed at the background location. This magnetometer was used to collect data at 15-minute intervals from the beginning until the end of the magnetometer survey, thus allowing for correction of diurnal drift. The background location, or base station, was located in the tree line between the northwest fill area and the central access road. The exact location and magnitude of the readings are relatively unimportant, but the fluctuations in the earth's magnetic field recorded are of primary importance.

All magnetic data were stored directly in the memory of the G856 magnometer. At each location, the G856 stores the magnetic field strength, time, station number (incremented by one for each reading), and assigned survey line number. These data, along with the data collected at the base station, were downloaded into an IBM-compatible computer using the software package MAGPAC, version 4.1.5, by EG&G Geometrics. MAGPAC allows the field data to be corrected for diurnal drift (using the base station data) and then converted to a form with x and y coordinates suitable for contouring. The corrected data were then plotted and contoured using the software package Surfer, version 4.10, by Golden Software, Inc. The final total earth field magnetics contour map and a discussion of the results are presented in Section 4.2.2.

3.3.2 Electromagnetic Ground Conductivity

Ground conductivity data were collected with a Geonics model EM31 conductivity meter equipped with a digital data logger (polycorder). This instrument was selected because its maximum depth of influence is 18 feet, and the depth of fill is estimated to be less than 14 feet. The EM31 was used to define waste disposal areas and individual cells, delineate conductive groundwater contaminant plumes, and screen monitoring well locations prior to drilling. Data were collected every 20 feet along east-west transects spaced 40 feet north to south as described previously. At each data collection node, a measurement was recorded in both the horizontal and vertical dipole modes. The depth of penetration in the vertical dipole mode is approximately 18 feet. The depth of penetration in the horizontal dipole mode is approximately 8 to 10 feet, and the instrument is more sensitive to shallow subsurface features than in the vertical dipole mode.

All conductivity data were stored directly in the memory of the polycorder. At each location, the polycorder stores the magnitude of the ground conductivity along with the x and y coordinates of that location for both the vertical and horizontal dipole modes. These data were then downloaded into an IBM-compatible computer using the software package DAT31, version 2.03, by Geonics, Limited. DAT31 allows the field data to be converted into a form suitable for contouring. The adjusted data were then plotted and contoured using Surfer version 4.10 by Golden Software, Inc. The final electromagnetic ground conductivity contour map and a discussion of the results are presented in Section 4.2.2.

3.3.3 Seismic Refraction Survey

Seismic refraction data were collected with a Geometrics Ltd., model 2401, 24-channel, signal enhancement seismograph. Data were collected along six lines, labeled A through F (see Figure 1, Appendix A), in separate 24-channel spreads consisting of 24 geophones laid out at 10-foot intervals along the 230-foot spread cable. Energy for the seismic survey was provided by a sledgehammer impacting a steel plate. Multiple hammer blows were recorded at each shot-point and digitally stacked in order to obtain sufficient energy and reduce the signal-to-noise ratio. In two instances, the signal-to-noise ratio was high and these two spreads were redone. Shot-points were located in the middle, at each end, and offset 115 feet from each end of the spread cable.

All recorded data were downloaded to a computer for interpretation. Interpretation included picking the first arrivals from each record, plotting time-distance graphs, and analyzing these graphs to assign arrival times. The site was found to best fit a three-layer model representing overburden, weathered bedrock, and competent bedrock. Data were analyzed using the RF software package developed by the U.S. Bureau of Reclamation, which uses algorithms from the widely-accepted Society of Exploration Geophysicists' General Reciprocal Method (GRM).

Appendix A contains the seismic refraction survey report prepared by Davenport/Hadley for this site, which contains detailed information on the collection, interpretation, and analysis of the seismic refraction data.

3.4 TRENCH EXCAVATION

The results of the total earth field magnetics and electromagnetic ground conductivity surveys indicated that numerous anomalies with varying intensity and areal extent exist at the site. Based on these results, which are discussed in Section 4.2.2, five areas were selected for trench excavation. These locations are shown in Figure 3-1. Trench 1 was excavated in the northwest corner of the northwest fill area in an area of very strong magnetic and ground conductivity (in both the horizontal and vertical dipoles) anomalies. Trench 2 was excavated in the central portion of the northeast fill area in an area exhibiting strong ground conductivity anomalies (in both the horizontal and vertical dipoles) and adjacent to a strong magnetic anomaly. Trench 3 was excavated in the southeast portion of the northwest fill area in an area exhibiting a very strong ground conductivity anomaly (in both the horizonal and vertical dipoles) and a moderately strong magnetic anomaly. Trench 4 was excavated in the northeast corner of the south-central fill area in an area exhibiting a very strong ground conductivity anomaly (in both the horizontal and vertical dipoles) and a moderately strong magnetic anomaly. Trench 5 was excavated in the central portion of the south fill area in an area exhibiting a very strong ground conductivity anomaly (in both the horizontal and vertical dipoles) and a moderately strong magnetic anomaly.

In terms of temporal distribution, landfilling reportedly proceeded in a north-to-south direction, beginning with the northwest fill area followed by the south-central, south, and northeast fill areas, respectively (Village of Wellsville 1986). Therefore, Trench 1 represents the oldest fill followed by Trench 3, Trench 4, Trench 5, and Trench 2, respectively. During excavation of Trench 1, a newspaper dated 1967 was found. Newspapers found in Trench 3 and Trench 2 date these areas to 1974 and 1980, respectively.

All trenches were excavated by E & E's subcontractor, Entech Management Services Corporation, using a Caterpillar Model 426 backhoe equipped with non-sparking teeth. All trenches were excavated approximately 3 feet wide by 12 to 15 feet long. The trench depths were dependent upon the material encountered and are discussed in Section 4.4.1. All trenches were excavated until the probable source of the anomaly was determined. The cover material was removed and placed alongside the trench. The waste was then removed and placed on the opposite side of the trench on plastic sheeting. After excavation and sampling were complete, the waste was placed back in the trench and the cover soil replaced on top. In all cases, additional clean fill (bank run gravel) was spread on top of the excavated area followed by hay. A description of the trenching and materials encountered is presented in Section 4.4.1.

During excavation, downwind air quality conditions were monitored with a photoionization detector (HNu), flame ionization detector (OVA), and MIE aerosol monitor (miniram). In addition, conditions near the backhoe were monitored with a combustible gas and oxygen (CG/O) meter.

One composite soil sample was collected from each trench for laboratory analysis. All samples were collected from the bucket of the backhoe or from the pile of excavated material using dedicated stainless-steel spoons, precleaned according to the procedures described in Section 3.14. All samples were analyzed by E & E's ASC for full Target Compound List (TCL) parameters according to NYSDEC CLP protocols. Table 3-2 describes the samples collected. For QA/QC purposes, additional volume was collected with sample TP-5 for matrix spike and matrix spike duplicate (MS/MSD) analyses. All sample preservation, shipping, and handling procedures were performed in accordance with the QAPjP.

3.5 GROUNDWATER MONITORING WELLS

3.5.1 Monitoring Well Installation

A total of 18 wells were installed between August 26 and October 4, 1991. All monitoring wells were installed by American Auger and Ditching Company, Inc., a subcontractor of E & E, under the guidance of an E & E geologist and site safety officer. Eight pairs of shallow and deep wells and two separate deep wells were installed. The shallow wells were screened across the water table, while the deep wells were screened either across the water table or within the first water-bearing zone below the first relatively competent bedrock layer encountered. The primary purposes of these wells were to establish groundwater flow direction, determine horizontal and vertical hydraulic gradients, describe the subsurface geology, and provide groundwater sampling points.

Monitoring well locations are shown on Figure 3-1. MW-1D was installed north and upgradient of the filled areas to assess background groundwater conditions in the bedrock aquifer. A shallow background well could not be installed because of the lack of water encountered in the overburden at this location. Additionally, due to the comparatively greater depth at which water was encountered in the bedrock, it was expected that very little water would exist in the overburden, even during periods of high precipitation. Three pairs of shallow and deep wells and a single deep well were installed along the eastern perimeter of the site. Monitoring well pair 2S and 2D was installed southeast of the northeast fill area in order to intercept possible groundwater contamination migrating from that area. MW-2S was installed 66 feet south of MW-2D near a small pond that is assumed to be spring fed based on its continual presence during the dry summer. MW-4D was installed as a single bedrock well at the northern end of the southern borrow pit. Competent bedrock was encountered at 9 feet, thereby precluding the installation of an overburden well. Monitoring well pair 5S and 5D was installed northeast of the southern fill area to intercept possible contamination from the south-central and/or south fill areas. Monitoring well pair 6S and 6D was installed just east of the south fill area to assess the fill area's impact on the groundwater.

Three well pairs were installed along the western perimeter of the site. Monitoring well pair 10S and 10D was installed just west of the northwest fill area and the leachate collection system. MW-9S and MW-9D were installed near the north access gate to assess the potential for contamination migrating south from the northwest area. MW-8S and MW-8D were installed immediately west of the south fill area in a bedrock "trough" identified during the seismic survey. However, after completion, MW-8D was deemed incompetent due to the presence of grout in the well casing. While subsurface information collected during the drilling of MW-8D has been used in this report, MW-8D was not used as a groundwater sampling point because the PVC casing had apparently collapsed and rendered the well inoperable. This well was subsequently abandoned and a new one drilled (as directed by NYSDEC on February 4, 1992) in its place on February 26 and 27, 1992. As agreed upon with NYSDEC, this new well will be sampled during the Phase II RI.

In addition to the perimeter wells, MW-3S and MW-3D were installed near the center of the site in a wide drainage swale adjacent to the drainage collection pond. Two additional wells were installed south of the site. MW-7D was installed to penetrate a bedrock trough trending north-south. At this location, no water was encountered in the overburden. Therefore, rather than install MW-7S, a new location was chosen approximately 190 feet west and downhill of MW-7D. This well was designated MW-11S.

Deep (Bedrock) Wells

All deep wells were screened entirely within the bedrock underlying the site. The screened intervals were determined in the field based on such factors as the presence of fractures, drilling water loss or gain, and well recharge determined by a bailer test. The bailer test consisted of bailing out the standing water in the open core hole and measuring the subsequent recharge. Additionally, an attempt was made to set all bedrock well screens in the same horizon near the top of bedrock across the site. However, due to the relief at the site, different types of bedrock were encountered at different locations.

During drilling, 2-foot split-spoon samples were collected continuously in the overburden. Split-spoon sampling was performed in conjunction with a standard penetration test as described in the American Society for Testing and Materials (ASTM) Designation D 1586-84, "Standard Method for Penetration Test and Split-Barrel Sampling of Soils." A 2-foot by 1.5-inch inside diameter (ID) hardened steel split-barrel sampler with shoe was driven in 2-foot depth intervals by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler 6 inches was recorded as the blow count on the subsurface boring log. These blow counts were used to assess the relative density of the overburden at each well location.

All split-spoon recoveries were logged in the field by an E & E geologist. Special note was made of all soil types encountered, changes in lithology, and the depth at which groundwater was encountered. Soil descriptions were based upon the Unified Soil Classification System (USCS). In addition, all recovered soil was screened for VOCs with an HNu and OVA. Soil samples were retained from each deep well boring for chemical and geotechnical analyses as outlined in Section 3.5.3. In addition to monitoring with an HNu and OVA, the borehole was continuously monitored with a CG/O meter, and the surrounding area downwind of the drilling location was monitored with a miniram.

The boreholes were advanced with 4.25-inch ID, continuous-flight, hollow-stem augers until bedrock refusal. Bedrock was then cored to the total depth of the well using HQ-size water coring techniques, yielding a nominal 4-inch diameter corehole. Water drilling techniques were chosen instead of air drilling techniques in order to suppress the escape of any VOCs encountered during drilling. The augers remained in place until the well was nearly completed to serve as temporary surface casing. All drill water was held for discharge to the leachate holding pond near the southern access gate. All soil cuttings were left at the borehole location because no recovered soils exhibited HNu readings in excess of 5 ppm above background.

Auger refusal was encountered twice in MW-1D. First, at a depth of 15 feet, refusal occurred on a competent siltstone layer approximately 1.5 feet thick. Below this layer was clay, derived from weathered shale, that was too soft to core. Therefore, augering resumed until refusal at a depth of 44 feet. Below this depth, the well was cored.

Once a bedrock well was drilled to its total depth and sufficient water was encountered, 10 feet of 2-inch ID, 0.010-inch machine-slotted, schedule 40, PVC screen was set in the bottom of the corehole. Flush-joint, threaded, schedule 40, PVC riser of the same diameter was positioned above the screen to an approximate height of 2.5 feet above the ground surface. A quartz sand filter-pack was then poured around the screen. The height of sand above the screen varied from 1.5 feet to 6 feet and was dependent upon the depth of the well and the depth at which water was encountered. Number 2 Q-Rok® quartz/silica sand was used in all wells except MW-7D and MW-10D, where Number 3 Q-Rok® was used. A bentonite seal was then placed above the sand pack. All deep wells were sealed within bedrock or across the interface to prevent direct overburden/bedrock communication within the well. All deep wells except MW-4D were sealed by mixing a slurry of 4 to 5 gallons of Benseal® (Wyoming bentonite chips) and pumping it downhole with tremie lines. This resulted in a 3.9- to 8.5-foot seal, depending on the amount of void space surrounding the riser. Since MW-4D was relatively shallow, a 2.5-foot bentonite pellet seal was emplaced by hand. Table 3-3 summarizes the monitoring well construction data for each well.

The remainder of the annulus around the well was filled to the surface with grout consisting of Portland cement and 5% bentonite. Bentonite was not used in the upper 3 feet of the grout to ensure stability for the locking steel protective casing that was furnished for each well. Each well was completed with a concrete drainage pad constructed on the ground surface around the protective casing to divert surface runoff away from the well. All wells were secured with a No. 3252 Master lock. Figure 3-2 depicts the deep (bedrock) well design.

Shallow (Overburden) Wells

One shallow well was installed at each monitoring well location depicted on Figure 3-1 with the exception of the locations adjacent to wells MW-1D, MW-4D, and MW-7D. As discussed previously, these locations were not suitable for overburden wells. All shallow wells were screened entirely within the overburden at and around the site. The depth of each shallow well was predetermined during split-spoon sampling of the adjacent deep well. The screens in the overburden wells were set at such a depth as to intercept the water table and to allow for seasonal variations in the elevation of the water table.

The boreholes were advanced to the appropriate depth below the water table with 4.25-inch ID, hollow-stem, continuous-flight augers. Two-inch ID, 0.010-inch machine-slotted, schedule 40, PVC well screen was then placed into the borehole. Ten feet of screen was used in all wells except MW-2S and MW-6S. Due to the shallow depths of these wells, 4 feet of screen was used in MW-2S and 7 feet was used in MW-6S. Number 2 Q-Rok® quartz/silica sand was then placed around the screen to serve as a filter pack. The height of sand above the screen varied from 1 foot to 5 feet and was dependent upon the depth of the well and the depth to water. In all shallow wells except MW-2S, a 2-foot thick bentonite seal was placed above the sand using hydrated Wyoming bentonite pellets. Since MW-2S was only 9 feet deep, there was only sufficient room for a 1-foot seal. The remainder of each well was constructed identically to the deep wells, as described previously. Figure 3-3 depicts the shallow (overburden) well design, and Table 3-3 contains monitoring well construction data.

As with the deep wells, an HNu, OVA, CG/O meter, and miniram were used to monitor the borehole. All soil cuttings were left uncontained at the well location because no recovered soils exhibited HNu readings in excess of 5 ppm above background.

On September 20, 1991 a sample of the water used for drilling and decontamination was collected from the driller's holding tank. This sample, identified as DW-1, was analyzed for full TCL parameters according to NYSDEC CLP protocols. The water used for decontamination and drilling was obtained with the permission of the Village of Wellsville from a hydrant located at the Wellsville water treatment plant. This water is obtained from the Genesee River, treated, and used as potable water within the village. Analysis indicated that this water was free of contaminants.

Subsurface boring logs for all of the wells installed during the Phase I RI are included in Appendix B.

3.5.2 Well Development

Following the completion of drilling activities, all 17 competent wells installed at the site were developed to repair formation damage caused by the drilling operation, thereby restoring the natural hydraulic properties of the aquifer, as well as to enhance water flow into the wells. Data collected during the development of each well are included in tabular form in Appendix C.

All wells were developed by water evacuation and surging. Well MW-5D was initially developed on September 26, 1991 by surging with a PVC bailer and then pumping at a low flow rate with a centrifugal pump. Wells MW-1D, MW-2D, MW-3D, MW-3S, MW-4D, MW-5S, MW-10D, and MW-11S were initially developed between October 8 and 11, 1991. These wells were all purged with a PVC bailer and then pumped at a low flow rate with a submersible pump. In addition to pumping, wells MW-10D and MW-11S were purged of 10 and 16 gallons, respectively, with a PVC bailer. Wells MW-6D, MW-6S, MW-7D, MW-8S, MW-9D, MW-9S, and MW-10S were initially developed between October 8 and 11, 1991 by surging and subsequent evacuation with a PVC bailer.

Following initial development, all wells were developed additionally between October 15 and 18, 1991. At this time, all wells, with the exception of MW-1D and MW-2D, were surged with a rubber surge block and then bailed with a stainless-steel bailer. MW-1D and MW-2D were bailed with a stainless-steel bailer only. MW-2S was not developed prior to October 15, 1991 due to a lack of water in the well.

During development, periodic measurements of the pH, conductivity, temperature, and turbidity of the groundwater were recorded. These data are presented in Appendix C, along with the volume of water removed from each well. The number of well volumes purged from each well varied from 5.8 to 143.4 and was a function of the well recharge and amount of standing water in the well. All readings stabilized prior to completion of development; however, the turbidity of the disturbed groundwater remained well above the NYSDEC goal of 50 nephelometric turbidity units (NTU) in all cases.

Due to the high percentage of silt and clay in the formation, the turbidity goal of 50 NTU could not be achieved without sacrificing the integrity of the wells. However, when the wells were allowed to recharge and stabilize prior to sampling, much of the suspended material settled out, yielding relatively clear samples (see Section 4.4.2).

3.5.3 Subsurface Soil Sampling

During subsurface drilling activities, the deep boring from each monitoring well pair was continuously sampled with a split spoon as described in Section 3.5.1. The samples were logged by a field geologist and monitored for the presence of VOCs using an HNu and OVA. Two subsurface soil samples were obtained from each of the 10 deep wells, with the exception of MW-2D. Due to the shallow depth to bedrock and the coarseness of the overburden, only one sample was collected from MW-2D. Including the duplicate sample, a total of 20 samples were collected for laboratory analysis. Eight samples consisting of two samples from the upgradient well MW-1D and two each from MW-6D, MW-7D, and MW-8D were collected and analyzed for full TCL parameters according to NYSDEC CLP methods. Samples from each of the remaining six deep borings were collected and analyzed for TCL VOCs and inorganic substances only. Table 3-4 lists the samples collected, and Figure 3-1 depicts the monitoring well/boring locations.

In addition to the samples retained for chemical analyses, subsurface soil samples were also collected from each deep boring for geotechnical analyses (see Table 3-4). Samples were collected from each major lithologic unit encountered at each well pair location. Geotechnical samples were retained until all drilling was complete. At that time, 19 samples were chosen for moisture content, grain-size distribution, hydrometer, and Atterberg limits testing.

All split-spoon samples were screened with an HNu and OVA immediately upon opening the spoon. Any sample in which VOCs were detected with the HNu were screened with vinyl chloride Draeger tubes. No readings were observed with the Draeger tubes.

No HNu readings were observed on any split-spoon sample except in MW-1D and MW-5D. HNu readings up to 5 ppm were observed in the upper 4 feet of MW-1D; however, these readings were interpreted as interference from water vapor in the topsoil. Fluctuating HNu readings of 0 to 2 ppm and 0 to 1 ppm were observed in the 6- to 8-foot and 8- to 10-foot interval split spoons, respectively, in MW-5D. Various OVA readings up to 10 ppm were observed in numerous wells. However, based on associated HNu readings, these readings were interpreted as methane and other light hydrocarbons.

Samples for chemical analysis were collected in areas exhibiting the greatest VOC concentration whenever possible. However, due to coarse soils and poor split-spoon recoveries, this was not always possible. Therefore, sample collection was also based on field observation of physical characteristics. Each split-spoon sampler was decontaminated prior to use, as described in Section 3.14. Preservation, shipping, and handling procedures were performed in accordance with the QAPjP.

Field QA/QC samples collected during subsurface soil sampling include one field duplicate, one rinsate blank, and one MS/MSD sample set for full TCL analysis, as well as one MS/MSD sample set for TCL VOC and inorganic substance analyses. The field duplicate for full TCL analysis was collected from MW-8D, and the MS/MSD sample set for full TCL analysis was collected from MW-6D. The MS/MSD sample set for TCL VOC and inorganic substance analyses was collected from MW-10D. The rinsate blank consisted of deionized water passed through a previously decontaminated split spoon. All sample preservation, shipping, and handling procedures were performed in accordance with the QAPjP.

3.5.4 Groundwater Sampling

Monitoring wells sampled during this phase of the RI included 17 of the 18 newly installed wells (excluding MW-8D) and the four wells installed during Malcolm Pirnie's Phase II study. Not including field QA/QC samples, a total of 21 groundwater samples were collected between October 22 and 24, 1991 and analyzed for full TCL parameters according to NYSDEC CLP methods.

Prior to groundwater sampling, static water levels were measured to within 0.01 foot in each well. All wells were then purged of three times the volume of water standing in the casing, with the exception of MW-2S and CW-3B. Due to very slow recharge rates, these wells were purged dry and only 2 and 1.4 well volumes, respectively, could be purged prior to sampling. Temperature, conductivity, and turbidity measurements were recorded at the time of sampling and are presented in Section 4.4.2.

Due to the presence of silt and clay in the surrounding formation, the turbidity in all wells remained above 50 NTU following development. Therefore, after purging, only the organic portion of the sample was collected. The well was then allowed to recharge, and the suspended sediment was allowed to settle overnight. Within 24 hours of purging, the inorganic portion of the sample was carefully collected in order to minimize sample turbidity. The turbidity of both the organic and inorganic sample portions was recorded and is presented in Section 4.4.2.

Dedicated, disposable, polyethylene bailers with dedicated polyethylene rope were used to purge and sample all the monitoring wells. Vials for VOC analysis were filled first, and care was taken not to agitate the sample. When the inorganic sample portion was collected, the bailer was used to carefully remove water from the top of the standing water column without agitating the settled sediment. The bottle for metals analysis was filled prior to the bottle for cyanide analysis, and both turbidities were recorded. Ten of the metals sampled had turbidities less than 50 NTU, while only two (GW-2S and GW-9S) had very high turbidities (>4,000 NTU).

Due to very slow recharge, sufficient sample volume could not be collected from MW-2S, MW-9S, and CW-3B for full TCL analysis. Therefore, samples GW-2S, GW-9S, and GW-12S were analyzed only for VOCs and metals.

All analyses were performed on unfiltered samples. Field QA/QC samples included a trip blank analyzed for TCL VOCs, as well as one field duplicate and one MS/MSD sample set analyzed for full TCL parameters. The field duplicate, designated GW-11SDD, was collected from MW-11S, and the MS/MSD sample set was collected from MW-10D. Sample preservation, shipping, and handling procedures were performed in accordance with the QAPjP for all groundwater samples.

3.6 RESIDENTIAL WELL AND SPRING SAMPLING

Five residential wells (Rosini, Teller, Kelly, Bauer, and Vacarro) and two groundwater springs (LaDue and Miller) were sampled on October 24 and 25, 1991 (see Figure 3-4). All samples were analyzed for full TCL parameters according to NYSDEC CLP methods, with the exception of VOCs, which were analyzed according to United States Environmental Protection Agency (EPA) Drinking Water Method 524.2.

Following sample collection, measurements of conductivity, temperature, and turbidity were recorded. These data are presented in Section 4.4.3. Due to an instrument malfunction, no pH data were collected.

Samples DW-2, DW-3, DW-4, and DW-7 (from the Teller, Kelly, Bauer, and Vacarro residences, respectively) were collected from the cold water tap of the kitchen sink. The Tellers and Vacarros use their wells for drinking and washing, whereas the Kellys and Bauers use their wells only for washing. All wells are used on a regular basis, and none is equipped with any type of filtration system. In each case, the cold water tap was allowed to run for 3 to 5 minutes. Vials of water for VOC analysis were collected first and in a manner that minimized disturbance.

The Vacarro residence is the site of the Fitzgibbon spring, sampled during previous investigations. The now-dry Fitzgibbon spring was located on the hillside west of Duffy Creek and Duffy Hollow Road. Following the sale of the Fitzgibbon property to the Bakers, the new owners utilized a spring on the hillside east of Duffy Creek. This spring still exists. The property was then purchased by Vacarro, and a bedrock well was drilled adjacent to the east side of Duffy Creek. Sample DW-7 was collected from this well to determine if contamination from the site has passed east of Duffy Creek.

Sample DW-1 (Rosini) was collected from an outside spigot. The Rosini well is used only for washing; however, since this is not a permanent residence, the well had not been used in several weeks. Therefore, three well volumes (approximately 425 gallons) were purged from the well prior to sample collection. Water was pumped, using the existing pump, through the spigot used for sample collection and allowed to discharge on the ground downgradient of the well. The sample was collected in a manner similar to that described previously for other residential water samples.

Sample DW-5 (LaDue) was collected from the spring currently used for drinking and washing at LaDue's seasonal residence. The spring that was sampled is approximately 500 feet east and downhill of the spring sampled during previous investigations. During the summer of 1991, Mr. LaDue deepened his old spring in an attempt to increase the flow rate. However, he broke through a confining clay layer, causing all water in the spring to flow out. Therefore, he dug a new spring further downhill. This spring, which is approximately 6 to 8 feet deep, is the one that was sampled. Because the spring is enclosed, water was collected from a PVC overflow pipe that allows excess water to exit at the base of the enclosure. Because water flows continuously from this pipe, the sample was collected immediately after arrival and in a manner similar to that described previously. Water from this spring is not filtered prior to use.

Sample DW-6 (Miller) was not collected from the spring sampled during previous investigations. That spring, which was located in the hillside northeast of the Miller's seasonal residence, was found to be dry at the time of sampling. Therefore, an 18-inch-deep sump was dug in a marshy area downhill from the former Miller spring and other active springs noted during the investigation. The bottom of the sump was an impervious clay and silt layer on which perched groundwater flows. When this location was sampled, the sump was noted to be overflowing with a continuous supply of clear water. Sample DW-6 was collected by carefully submerging the sample bottles in the sump. The sample portions for VOC and metals analyses were collected first in a manner that minimized disturbance of the settled sediment at the bottom of the sump.

In addition to the above samples, QA/QC samples collected included a duplicate (DW-5D) from the LaDue spring and additional volume from the Teller well (DW-2) for MS/MSD analyses.

Sample preservation, shipping, and handling procedures were performed in accordance with the QAPjP for all domestic water samples.

3.7 SURFACE WATER AND SEDIMENT SAMPLING

A total of six surface water samples were collected from the two streams bordering the site. At each surface water sampling location, a sediment sample was also obtained. The approximate locations of the surface water and sediment samples are shown in Figure 3-4 and are described as follows:

- Two samples were collected as far upgradient in each stream as possible, in order to determine background conditions. One sample (SW-1/SED-1) was obtained from the unnamed tributary north of Pump Station 1. The furthest upstream that SW-1/SED-1 could be collected was where surface runoff from the site first enters the tributary. Upstream of this location, the tributary was nearly dry and did not facilitate sample collection. Therefore, SW-1/SED-1 is not considered representative of background conditions in the unnamed tributary. Sample SW-2/SED-2 was taken from Duffy Creek west of Duffy Hollow Road, approximately 1,000 feet south of Pixley Hill Road. This sample is expected to represent background conditions in Duffy Creek.

- Sample SW-3/SED-3 was collected from a pool in the unnamed tributary west and slightly downstream of Pump Station 1.

- Sample SW-4/SED-4 was obtained from a pool downstream of the site in Duffy Creek, approximately 500 feet upstream of its confluence with the unnamed western tributary.

- Sample SW-5/SED-5 was collected approximately 350 feet downstream of the confluence of Duffy Creek and its unnamed western tributary.

- Sample SW-6/SED-6 was obtained approximately 800 feet downstream of the confluence of Duffy Creek and its unnamed western tributary to determine if there is any downstream risk associated with the site.

Samples were collected from downstream to upstream so that any disturbances (turbulence) caused by sampling activities would not affect downstream sampling locations. Additionally, the surface water samples were collected prior to the sediment samples at each location. Samples were collected by carefully submerging precleaned bottles directly into the creek in such a way as to minimize agitation of the water.

The six surface water samples were analyzed for full TCL parameters, as well as hardness, by the methods described in Section 3.1. All samples were analyzed unfiltered. Field QA/QC samples included one field duplicate (SW-4D) for full TCL and hardness analyses and one MS/MSD sample set for full TCL analysis, both of which were collected from the same location as SW-4.

The six corresponding sediment samples were analyzed for full TCL parameters according to the NYSDEC CLP methods, as well as percent organic matter by ASTM methods (see Section 3.1). Field QA/QC samples include one field duplicate for full TCL and percent organic matter analyses (SED-4D) and one MS/MSD sample set for full TCL analysis, both of which were collected from the same area as SED-4.

Sample locations were chosen from places where sediment accumulates. Sediment samples were collected from near shore with minimal disturbance, using dedicated stainless-steel spoons, and transferred directly into appropriate prelabeled sample containers.

Sample preservation, shipping, and handling procedures were performed in accordance with the QAPjP for all surface water and sediment samples.

3.8 SURFACE SOIL SAMPLING

Biased surface soil samples (0 to 4 inches deep) were collected from 12 locations where physical evidence of contamination existed (SS-3 through SS-14). These locations were selected in the field based on visual observations (i.e., leachate outbreaks, stained soil, etc.) and HNu readings. These samples consisted of leachate-stained sediment and soil as well as other surficial materials including the cover material. Two additional samples (SS-1 and SS-2) were collected from undisturbed areas in the vicinity of the upgradient monitoring well MW-1D (upgradient of the fill areas) to serve as background soil samples. Table 3-5 describes the location of each surface soil sample. Figure 3-1 depicts the soil sampling locations.

Surface soil samples were collected with precleaned, dedicated, stainless-steel spoons. An appropriate amount of soil, excluding gravel, roots, and organic matter, was placed directly into precleaned, prelabeled sample jars. VOC sample bottles were filled first with material that was as undisturbed as possible.

All 14 surface soil samples were analyzed for full TCL parameters according to NYSDEC CLP methods. Field QA/QC samples included one field duplicate (SS-10D) collected from the same location as SS-10 and an MS/MSD sample set collected from the same location as SS-11 for full TCL analysis. Analytical methods are summarized in Section 3.1. All preservation, shipping, and handling procedures were performed in accordance with the QAPjP.

3.9 LEACHATE SAMPLING

Leachate samples were to be collected from six locations within the on-site leachate collection system. Four of the samples were to be collected from manholes on the mainline and two from 6-inch-diameter PVC risers on the lateral lines. The manholes and risers to be sampled were to be those containing the highest concentrations of VOCs as determined during the air monitoring described in Section 3.10. However, when the selected manholes and risers were opened, no liquid leachate was found. The remaining manholes were then checked, and most were found to contain no liquid leachate or an amount insufficient to sample. The drain pipes at the bottom of the manholes were found to contain sediment, with the leachate most likely flowing through the sediment and/or the stone surrounding the drain pipe.

Due to the lack of liquid leachate, only two locations were sampled. Sample L-1 was collected from Manhole 4 across Snyder Road from Pump Station 1. Through this manhole, leachate from the northeast, northwest, and south-central fill areas passes prior to entering the sump at Pump Station 1. Sample L-2 was collected from the sump at Pump Station 2, which collects leachate from the south fill area only. These locations are shown on Figure 3-1.

The following procedures were used to collect the leachate samples:

- Upon opening the manhole, the head space and breathing zone were monitored with an HNu.
- A dedicated polyethylene bailer was lowered slowly into the manhole as often as necessary to fill the required sample jars. VOC sample bottles were filled from the initial bail of leachate at each location.
- Leachate samples were poured carefully from the bailer into precleaned and prelabeled sample bottles.
- Preserving, shipping, and handling procedures were performed in accordance with the QAPjP.

Field parameters, including pH and conductivity, were measured. These results are discussed in Section 4.4.7.

The two samples collected from the leachate collection system were analyzed for full TCL parameters according to NYSDEC CLP methods. Field QA/QC samples included one MS/MSD sample set for full TCL analysis collected from the same location as L-2. Analytical methods are outlined in Section 3.1.

In accordance with the work plan, no leachate samples were collected from the pump stations for Toxicity Characteristic Leaching Procedure (TCLP) analysis because the analytical results from L-1 and L-2 did not warrant this analysis.

3.10 AIR SAMPLING

The sampling strategy involved a graduated approach. First, all of the manholes and risers in the leachate collection system were screened using an HNu, OVA, and vinyl chloride Draeger tubes. The screening was accomplished by inserting the probe directly into the manhole or riser, either through an existing hole or by lifting the cover just enough to admit the probe. This procedure was used to avoid venting the manholes and risers and dispersing any gas collected in them. The readings obtained reflect the total concentration of the VOCs (aromatics such as benzene, toluene, and xylene and chlorinated alkenes such as tetrachlorethene [PCE], TCE, DCE, and vinyl chloride) of interest from a risk standpoint. Originally, leachate samples were to be collected from various areas of the leachate collection system in order to assess the relative contributions of contaminants from each fill area.

However, due to insufficient liquid sample volume, the air sampling strategy was altered to achieve that goal and support the risk assessment. Rather than selecting the six locations with the highest PID readings, the "hottest" manholes and/or risers near each fill area were sampled. Four manholes and two risers were selected for formal gas sampling. Table 3-6 summarizes the air samples collected. Figure 3-1 depicts the locations of the manholes and risers sampled. Results of the air monitoring and sampling activities are presented in Section 4.4.8.

The formal sampling was done using EPA method TO-14 (USEPA 600/4-84-041, April 1984; Second Supplement, June 1988), which involves drawing a whole air sample into a 6-liter SUMMA® passivated canister. SUMMA® passivation involves coating the interior of the stainless-steel canister with a nickel-chromium oxide that deters VOCs from adhering to the interior walls. Evacuated canisters were obtained from Air Toxics, Ltd., the analytical laboratory subcontracted to perform the analyses.

A sample of 4 to 6 liters was drawn from the manhole or riser through a 2-foot Teflon tube attached to the canister inlet with a 1-foot stainless-steel tube. Sampling was performed over a short time period (i.e., 2 to 3 minutes) because conditions in the collection system should have remained relatively stable.

Once the samples were collected, they were shipped to the laboratory for Method TO-14 analysis. Method TO-14 involves cryogenically trapping the VOCs in the sample and analyzing them using a high-resolution gas chromatograph coupled with the appropriate detectors.

In addition to the samples collected from the manholes and risers, a duplicate sample and field blank were also analyzed for QA purposes. The duplicate sample, designated A-6, was collected from Riser R-2. The field blank consisted of a previously evacuated canister into which 4 to 6 liters of purified nitrogen was run. The purpose of the blank was to act as a trip blank and to assess the VOC contribution made by the attached tubing.

3.11 LEACHATE COLLECTION SYSTEM EVALUATION

In conjunction with the ground-based survey and leachate sampling, E & E collected data in order to determine the effectiveness of the leachate collection system as well as means to increase its effectiveness, if necessary. In order to evaluate the system, the following information regarding its construction and operation was collected:

- Verification of vertical and horizontal layout of the collection system by means of a ground survey;
- Review of selected records from the Village of Wellsville wastewater treatment facility regarding delivery of leachate from the landfill in an attempt to determine seasonal and climatic trends; and

- Estimation of flow rates at various points in the collection system to determine the relative contribution of leachate from the individual fill areas.

Data will be used in the determination of which areas, if any, are suited for phased or interim remedial actions in addition to the development of final remedial solutions. Results pertaining to the leachate collection system are not included in this draft of the RI report but will be included in the first draft of the FS report.

3.12 HABITAT-BASED ECOLOGICAL ASSESSMENT

In order to characterize the ecological resources associated with the Wellsville-Andover Landfill site, E & E conducted initial background research. In addition, E & E biologists conducted a field reconnaissance of the terrestrial and aquatic communities existing at and in the general vicinity of the site on October 24, 1991.

E & E's scope of work addresses items identified in Step I of the NYSDEC document Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites.

The following is a discussion of the approach E & E utilized to characterize ecological communities associated with the Wellsville-Andover Landfill site.

Terrestrial Ecosystems

Prior to field work, E & E analyzed current USGS topographic maps, United States Department of Agriculture (USDA) Soil Conservation Service (SCS) soils maps, and NYSDEC Wetland Maps to distinguish vegetative cover types. Cover type designations correlate to cover types described by the New York State Natural Heritage Program (NYSNHP) in its Ecological Communities of New York State. Both the NYSNHP and NYSDEC regional offices, as well as any other pertinent agencies, were contacted to identify any significant habitats known to occur on or near the site.

Field reconnaissance was used to verify the initial cover type mapping. Each cover type was surveyed in the field by traversing random but representative transects. Within each cover type, dominant species in the overstory, understory, and herbaceous layers were identified.

Potential wetlands were characterized and map-delineated following procedures detailed in the Corps of Engineers Wetland Delineation Manual (Department of the Army 1987) that use hydric soils, wetland hydrology, and hydrophytic vegetation for making wetland determinations.

Evidence of disturbed or stressed vegetation was noted, and each cover type was evaluated with regard to its relative value for wildlife habitat. Potential wildlife utilization was determined primarily through literature review supported by in-field observations. Because of the mobile and often nocturnal habits of mammals and the transitory nature of avifauna, verification relied on evidences of wildlife utilization in the form of browse, tracks, burrows, or scat. Bird species were identified by sight and call.

Aquatic Ecosystems

Collection of information characterizing the aquatic ecosystem relied primarily on project field surveys. As for the terrestrial ecosystems, NYSNHP and NYSDEC were contacted to identify any significant communities or species in the vicinity of the Wellsville-Andover Landfill site, as well as typical species that might be expected.

Duffy Creek and its unnamed tributary were surveyed to characterize their various ecological features and infer their relative quality based primarily on the type, number, and diversity of benthic organisms present. In addition, basic water chemistry data were collected.

To characterize the physical nature of the streams, depth, width, bottom composition, stream flow, bank height, and fish habitat characteristics were observed and recorded at sampling locations. Riparian vegetation adjacent to the stream was characterized as to successional stage, species composition, and canopy closure. The presence or absence of in-stream submergent and emergent vegetation was used to assess the relative health of the aquatic community.

3.13 QUALITY CONTROL (QC) SAMPLES AND PROCEDURES

All field work and sampling activities at the site were performed in accordance with E & E's June 1991 Quality Assurance Project Plan (QAPjP), Phase I Remedial Investigation/Feasibility Study (RI/FS) for the Wellsville-Andover Landfill Site in Wellsville, New York as well as the June 1991 Remedial Investigation/Feasibility Study, Health and Safety Plan (HASP) for the Wellsville-Andover Site.

As described in the June 1991 QAPjP and work plan, several field QC samples were required for the various media sampled. Duplicate samples were collected for subsurface soils (SB-8AD), groundwater (GW-11SDD), domestic water (DW-5D), surface water (SW-4D), sediment (SED-4D), surface soil (SS-10D), and air (A-6). MS/MSD sample sets were collected for test pit samples (TP-5), subsurface soil (SB-6A and SB-10A), groundwater (GW-10D), domestic water (DW-2), surface water (SW-4), sediment (SED-4), leachate (L-2), and surface soil (SS-11). All of the above samples were analyzed for full TCL parameters, with the exception of the MS/MSD set collected from SB-10A, which was analyzed for VOCs and inorganic substances only, and the air sample duplicate, which was analyzed for VOCs only by Method TO-14.

Other field QC samples collected include one rinsate (R-1), one air sample blank (A-8), and three trip blanks. The rinsate sample, collected at the time of subsurface soil sampling, was collected by pouring laboratory deionized water through a split spoon previously decontaminated according to the procedures in Section 3.14. This sample, analyzed for full TCL parameters, was used to check the decontamination procedure. The air sample blank consisted of an unopened SUMMA® canister transported to and from the field with the other canisters in order to assess potential leakage and ambient conditions. This sample was analyzed for VOCs by Method TO-14. Three trip blanks, analyzed for VOCs only, were incorporated with sample shipments containing water samples on October 2, 4, and 25, 1991.

In addition to the above, a sample of the water used for drilling and decontamination (DW-1) was collected from the driller's holding tank. This water, analyzed for full TCL parameters, consisted of potable water collected from a hydrant at the Village of Wellsville's water treatment plant.

3.14 DECONTAMINATION PROCEDURES

All decontamination was performed in accordance with NYSDEC-approved procedures. Sampling methods and equipment were chosen to minimize decontamination requirements and prevent the possibility of cross-contamination. All drilling equipment was decontaminated prior to drilling, after drilling each monitoring well, and after the completion of all monitoring wells. Specific attention was given to the drilling assembly, augers, split spoons, and PVC casing and screens. Split spoons were decontaminated prior to and following each use. Decontamination of drilling equipment consisted of:

- Removal of foreign matter, followed by
- High-pressure steam-cleaning.

Sampling equipment, including stainless-steel spoons, was decontaminated using the following procedure:

- Washing in a trisodium phosphate (TSP) solution;
- Rinsing with potable water;
- Rinsing with 10% nitric acid;
- Rinsing with deionized water;
- Rinsing with pesticide-quality methanol;
- Rinsing with deionized water; and
- Air drying.

A temporary decontamination pad was constructed west of the leachate holding pond using plywood and heavy plastic sheeting. The primary purpose of the pad was to support decontamination of heavy equipment, such as the drill rig and augers. Fluids generated during decontamination were pumped from the pad directly into the leachate holding pond. Split spoons were often steam-cleaned at the drill site in a tub, and the generated water was transported to the leachate holding pond for disposal.

No soil cuttings generated during monitoring well installation exhibited HNu readings greater than 5 ppm above background. Therefore, all soil was left on the ground near the monitoring well, except at MW-7D and MW-11S. Since these wells were off site, the soil was transported to the site and disposed.

All waters generated by decontamination or by developing, purging, or pumping monitoring wells were transported to the leachate holding pond. All expendable materials generated during the investigation (i.e., Tyvek clothing, gloves, spoons, plastic sheeting from the decontamination pad, etc.) were placed in U.S. Department of Transportation (DOT)-approved 17H drums and stored at a central location on site. All drums containing investigation-derived waste were labeled with type of generated material, the site name, the location where the material was generated, and the date when the material was generated.

Personal decontamination was performed in accordance with the HASP.

Table 3-1

ANALYTICAL METHODS SUMMARY

Method Reference	Method Number	Brief Description of Method	Matrix
Atterberg Limits ASTM	D4318-84	Liquid and plastic limit, plasticity index	Soil
Cyanide-Total ASP	335.2	Spectrophotometric	Water
ASP	9010	Colorimetric	Soil
Grain Size ASTM	D422-63	Sieve and hydrometer analysis	Soil
Hardness ASP	130.2	Titrimetric, EDTA	Water
Moisture Content ASTM	D2216-90	Heat to 110°C	Soil
Percent Organic Matter ASTM	D2974-87	Ash content, heat to 440°C in muffle furnace	Sediment
Aluminum ASP CLP	200.7-M	ICP	Soil, Water
Arsenic ASP CLP	206.2-M	Furnace AA	Soil, Water
ASP	6010	ICP	Soil, Water
Barium ASP CLP	200.7-M	ICP	Soil, Water
ASP	6010	ICP	Soil, Water
Beryllium ASP CLP	200.7-M	ICP	Soil, Water
Cadmium ASP CLP	200.7-M	ICP	Soil, Water
ASP	6010	ICP	Soil, Water
Calcium ASP CLP	200.7-M	ICP	Soil, Water
Chromium ASP CLP	200.7-M	ICP	Soil, Water
ASP	6010	ICP	Soil, Water
Cobalt ASP CLP	200.7-M	ICP	Soil, Water

Table 3-1

ANALYTICAL METHODS SUMMARY

Method Reference	Method Number	Brief Description of Method	Matrix
Copper			
ASP CLP	200.7-M	ICP	Soil, Water
Iron			
ASP CLP	200.7-M	ICP	Soil, Water
Lead			
ASP CLP	239.2-M	Furnace AA	Soil, Water
ASP CLP	200.7-M	ICP	Soil, Water
ASP	6010	ICP	Soil, Water
Magnesium			
ASP CLP	200.7-M	ICP	Soil, Water
Manganese			
ASP CLP	200.7-M	ICP	Soil, Water
Mercury			
ASP CLP	245.1-M	Manual cold vapor	Soil, Water
ASP	7470	Cold vapor-liquid	Water
Nickel			
ASP CLP	200.7-M	ICP	Soil, Water
Potassium			
ASP CLP	200.7-M	ICP	Soil, Water
Selenium			
ASP CLP	270.2-M	Furnace AA	Soil, Water
ASP	6010	ICP	Soil, Water
Silver			
ASP CLP	200.7-M	ICP	Soil, Water
ASP	6010	ICP	Soil, Water
Sodium			
ASP CLP	200.7-M	ICP	Water
Thallium			
ASP CLP	279.2-M	Furnace AA	Soil, Water
Vanadium			
ASP CLP	200.7-M	ICP	Soil, Water
Zinc			
ASP CLP	200.7-M	ICP	Soil, Water

Table 3-1

ANALYTICAL METHODS SUMMARY

Method Reference	Method Number	Brief Description of Method	Matrix
Base/Neutral/Acid Extractables			
ASP CLP	89-2	Extraction, GC/MS	Soil, Water
Volatile Organic Compounds			
ASP CLP	89-1	Purge & Trap, GC/MS	Soil, Water
ASP	524.2	Purge & Trap, GC/MS	Drinking water
Pesticides/PCBs			
ASP CLP	89-3	Extraction, GC/ECD	Soil, Water

Key:

AA = Atomic absorption spectroscopy.
ASP = NYSDEC Analytical Services Protocol, September 1989.
ASTM = American Society of Testing and Materials, 1991.
GC/MS = Gas chromatograph/mass spectrometer.
GC/ECD = Gas chromotograph/electron capture detector.
CLP = Contract Laboratory Program SOW, July 1988, modified.
ICP = Inductively coupled argon plasma.

Source: Ecology and Environment Engineering, P.C. 1992.

Table 3-2

SOIL SAMPLES COLLECTED DURING TRENCH EXCAVATION

Sample Number	Trench Number	Date	Approximate Depth (feet)	Analysis	Description
TP-1	1	12-19-92	6	Full TCL	Saturated dark gray clay loam with minor trash fragments on which black liquid contents of drum leaked.
TP-2	2	12-19-92	5 to 6	Full TCL	Moist, dark gray to black clay loam with minor trash fragments. Collected from bucket that scraped along full 12-foot length of trench.
TP-3	3	12-19-92	6	Full TCL	Saturated dark gray and brown clay loam with minor trash fragments collected from northeast end of trench near unknown scrap metal.
TP-4	4	12-18-92	3	Full TCL	Moist brown clay loam containing pieces of plastic buttons from trench as well as fragments of pink and white plastic material from drums. Includes material directly from partially removed drum.
TP-5	5	12-18-92	4	Full TCL	Saturated medium gray clay loam with rock and municipal trash fragments collected at the level of the water table below a crushed oil drum.

Source: Ecology and Environment Engineering, P.C. 1992.

Table 3-3

MONITORING WELL CONSTRUCTION DATA[a]

Well	Depth to Auger Refusal	Total Depth	Depth of Screened Interval	Depth of Sand Pack	Depth of Bentonite Seal
1D	44.0	74.5	64.5 - 74.5	61.9 - 74.5	58.0 - 61.9
2D	24.0	61.0	49.0 - 59.0	43.0 - 61.0	36.5 - 43.0
2S	9.0[b]	9.0	5.0 - 9.0	4.0 - 9.0	3.0 - 4.0
3D	25.0	41.6	30.0 - 40.0	28.0 - 41.6	22.5 - 28.0
3S	19.0[b]	19.0	9.0 - 19.0	7.0 - 19.0	5.0 - 7.0
4D	9.0	23.3	12.0 - 22.0	10.0 - 23.3	7.5 - 10.0
5D	23.5	36.8	26.5 - 36.5	25.0 - 36.8	19.0 - 25.0
5S	--	22.0	10.0 - 20.0	8.0 - 22.0	6.0 - 8.0
6D	14.6	28.3	18.0 - 28.0	16.0 - 28.3	11.0 - 16.0
6S	14.8	13.5	6.5 - 13.5	5.0 - 13.5	3.0 - 5.0
7D	26.0	45.4	35.1 - 45.1	31.0 - 45.4	24.0 - 31.0
8D[c]	64.0	77.0	67.0 - 77.0	65.5 - 77.0	57.0 - 65.5
8S	--	20.7	7.0 - 17.0	5.5 - 20.7	3.5 - 5.5
9D	29.0	45.4	35.1 - 45.1	32.0 - 45.4	26.0 - 32.0
9S	--	19.3	9.0 - 19.0	7.0 - 19.3	5.0 - 7.0
10D	29.0	43.4	33.1 - 43.1	31.0 - 43.4	26.0 - 31.0
10S	--	24.3	14.0 - 24.0	9.0 - 24.3	7.0 - 9.0
11S	>24	23.6	8.0 - 18.0	6.0 - 23.6	4.0 - 6.0

[a] All depths are in feet below ground surface (BGS).

[b] Different depths to auger refusal in shallow well achieved due to change in bit type.

[c] Well found to be incompetent after completion.

Source: Ecology and Environment Engineering, P.C. 1991.

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Table 3-4

SUBSURFACE SOIL SAMPLES COLLECTED DURING WELL DRILLING

Well Number	Sample ID	Depth (feet)	Date	Analysis
MW-1D	SB-1A	12 - 14	08-27-91	Full TCL
	SB-1B	1 - 2	08-29-91	Full TCL
	1D[a]	0 - 2	08-30-91	Geotechnical
MW-2D	SB-2A	6.5 - 7.5	09-03-91[a]	TCL volatiles and inorganics
	2D[a]	4 - 6	09-03-91	Geotechnical
MW-3D	SB-3A	1 - 2	09-05-91[a]	TCL volatiles and inorganics
	SB-3B	10 - 12	09-05-91[a]	TCL volatiles and inorganics
	3D[a]	5 - 6	09-05-91	Geotechnical
	3D[b]	22 - 24	09-05-91	Geotechnical
MW-4D	SB-4A	2 - 4	09-09-91	TCL volatiles and inorganics
	5B-4B	7 - 9	09-09-91	TCL volatiles and inorganics
	4D[a]	1 - 2	09-09-91	Geotechnical
MW-5D	SB-5B	8 - 9	09-10-91	TCL volatiles and inorganics
	SB-5C	18 - 19	09-10-91	TCL volatiles and inorganics
	5D[a]	8 - 10	09-10-91	Geotechnical
MW-6D	SB-6A[b]	6 - 10	09-11-91	Full TCL
	SB-6B	12 - 14	09-12-91	Full TCL
	6D[a]	2 - 4	09-11-91	Geotechnical
	6D[b]	12 - 14	09-12-91	Geotechnical
MW-7D	SB-7A	8 - 10	10-01-91	Full TCL
	SB-7B	20 - 21 and 22 - 23	10-01-91	Full TCL
	7D[a]	10.5 - 11	10-01-91	Geotechnical
	7D[b]	20 - 22	10-01-91	Geotechnical
MW-8D	SB-8A	7 - 9	09-20-91	Full TCL
	SB-8AD[c]	7 - 9	09-20-91	Full TCL
	SB-8B	21 - 23	09-20-91	Full TCL
	8D[a]	1 - 3	09-20-91	Geotechnical
	8D[b]	11 - 12	09-20-91	Geotechnical
	8D[c]	43 - 44	09-25-91	Geotechnical
MW-9D	SB-9A	4 - 6	09-18-91	TCL volatiles and inorganics
	SB-9B	26 - 27.5	09-18-91	TCL volatiles and inorganics
	9D[a]	1 - 3	09-18-91	Geotechnical
	9D[b]	14 - 16	09-18-91	Geotechnical
MW-10D	SB-10A[b]	5 - 7	09-13-91	TCL volatiles and inorganics
	SB-10B	18 - 19	09-16-91	TCL volatiles and inorganics

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Table 3-4

SUBSURFACE SOIL SAMPLES COLLECTED DURING WELL DRILLING

Well Number	Sample ID	Depth (feet)	Date	Analysis
MW-11S	11S[a]	17 - 18	10-03-91	Geotechnical
--	CL-1[d]	1.5 - 2	10-25-91	Geotechnical

Note: Geotechnical analysis refers to moisture content, grain size, and hydrometer analysis and Atterburg limits testing.

[a] Portion for TCL volatile analysis re-collected 10-03-91.
[b] MS/MSD sample set also collected for QA/QC.
[c] Duplicate sample for QA/QC.
[d] Sample of confining layer material collected from area of Miller spring.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 3-5

SURFACE SOIL SAMPLE LOCATIONS

Sample Number	Description
SS-1	Background soil sample from undisturbed ground approximately 50 feet northwest of MW-1D.
SS-2	Background soil sample from shallow ditch along west side of dirt road, due west of MW-1D.
SS-3	Head of active leachate seep at southwest corner of northeast fill area. Seep is not stained orange and red like other seeps on site.
SS-4	East bank of the small standing surface water body adjacent to and west of MW-2S.
SS-5	Bottom of the southeast corner of the drainage collection pond at a point where runoff from the northeast portion of the site enters the pond.
SS-6	Head of an active leachate seep in the east-central portion of the northwest fill area. Soil was stained dark red.
SS-7	Head of an active leachate seep in the southwest portion of the northwest fill area. Soil, which was stained red, was collected near point of bubbling gas escape.
SS-8	Base of an active leachate seep (immediately west of bubbling seep) in the southwest portion of the northwest fill area. Soil was stained red.
SS-9	In the confluence of two ditches adjacent to the gate at the northern access road in order to assess the potential for off-site contaminant migration. One ditch runs along the west side of the northwest fill area and the other along the east and south sides of that fill area.
SS-10	South of the sump at Pump Station 2 where leachate often overflows. Soil was stained red.
SS-10D	Duplicate of SS-10.
SS-11	Head of an inactive leachate seep in the center of the south fill area. Soil was stained reddish-orange.
SS-12	In a shallow runoff ditch cut into the cover along the south side of the south-central fill area.
SS-13	In a ditch along the south side of the dirt access road to LaDue's home. Collected near a culvert where leachate from Pump Station 2 can pass onto LaDue's property, in order to assess the potential for off-site contaminant migration.
SS-14	In a shallow ditch on the property of E. Ormsby east and downhill of the northeast fill area, in order to assess the potential for off-site contaminant migration.

Source: Ecology and Environment Engineering, P.C. 1991.

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Table 3-6

AIR SAMPLES COLLECTED FROM THE LEACHATE COLLECTION SYSTEM DECEMBER 19, 1991

Sample Number	Canister Number	Manhole/Riser	Description
A-1	11302	MH-10	Collected to evaluate the relative VOC contribution from the northern portion of the northwest fill area.
A-2	11303	R-10	Collected to evaluate a "hot spot" in the northwest fill area.
A-3	11306	MH-6	Collected to evaluate the relative VOC contribution from the southern portion of the northwest fill area.
A-4	11305	MH-15	Collected to evaluate the relative VOC contribution from the northeast fill area.
A-5	11300	R-2	Collected to evaluate a "hot spot" as well as the relative VOC contribution from the south fill area.
A-6	11301	R-2	Duplicate of A-5 for QA/QC.
A-7	11299	MH-3	Collected to assess the relative VOC contribution from the south-central fill area.
A-8[a]	11298	NA	Field blank for QA/QC.

[a] Purified nitrogen from E & E's ASC collected on 12-20-91.

Source: Ecology and Environment Engineering, P.C. 1991.

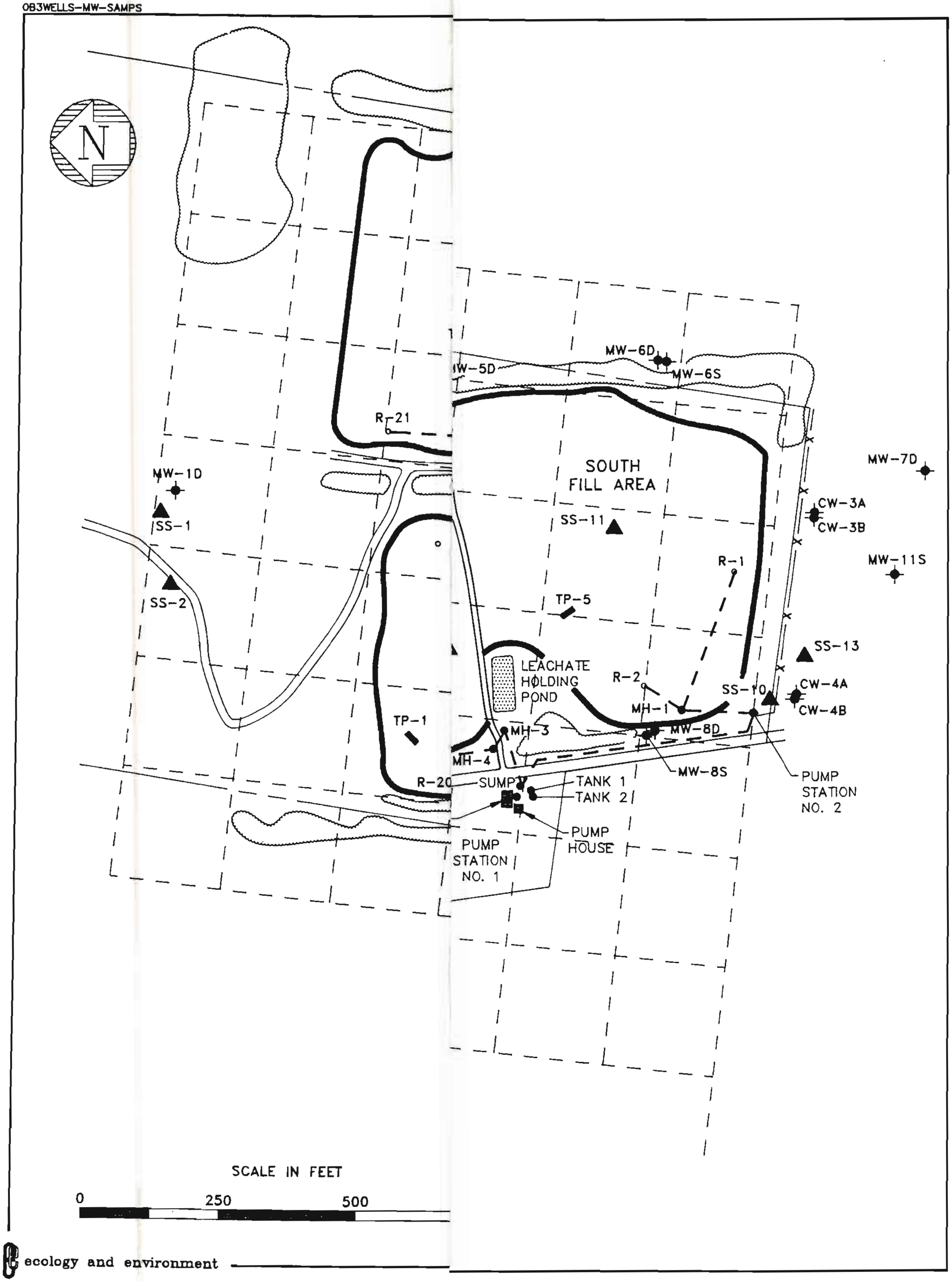

Figure 3-1 MONITORING WELL AND SAMPLING LOCATIONS WELLSVILLE-ANDOVER LANDFILL

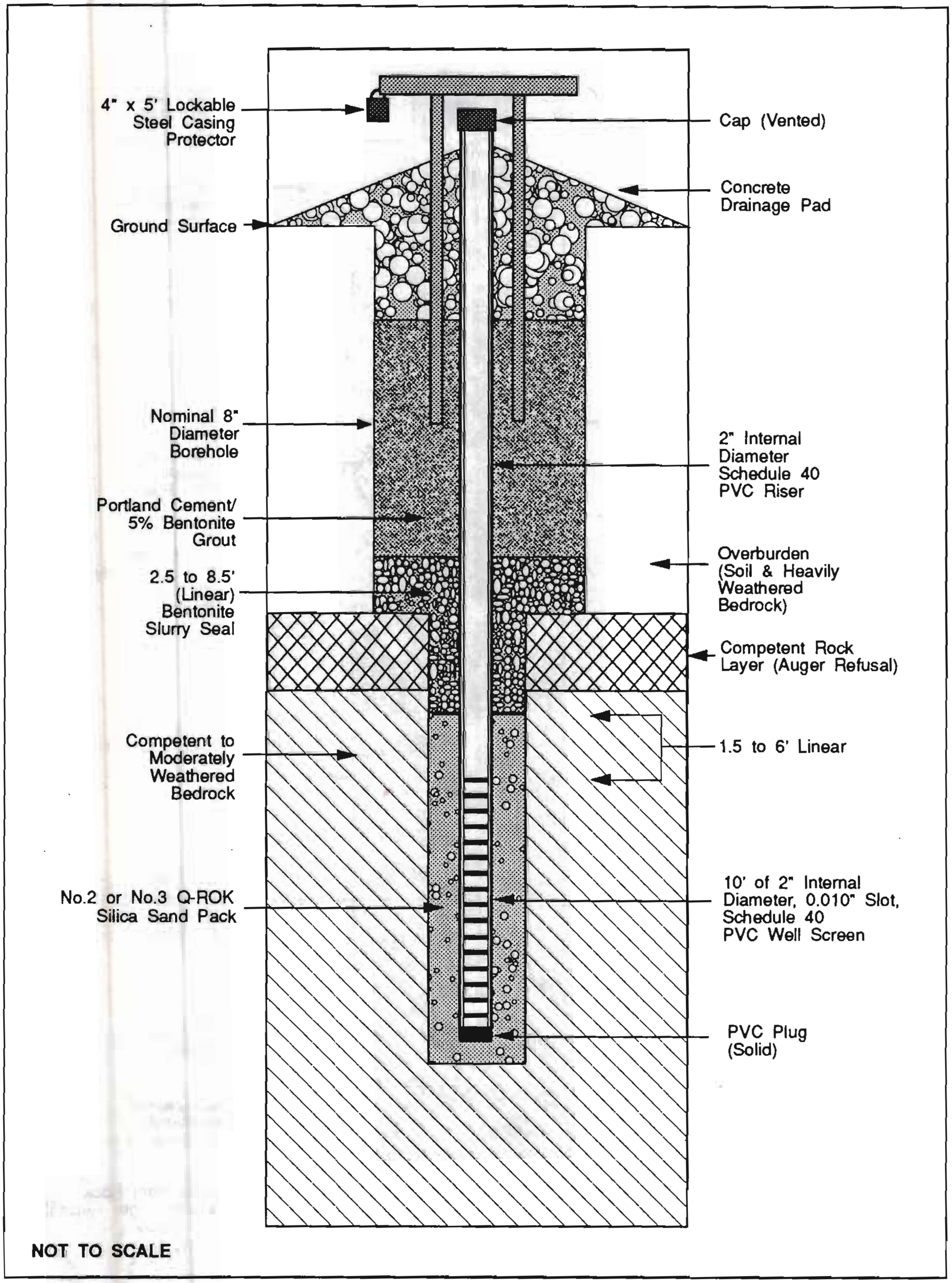

Figure 3-2
DEEP MONITORING WELL CONSTRUCTION

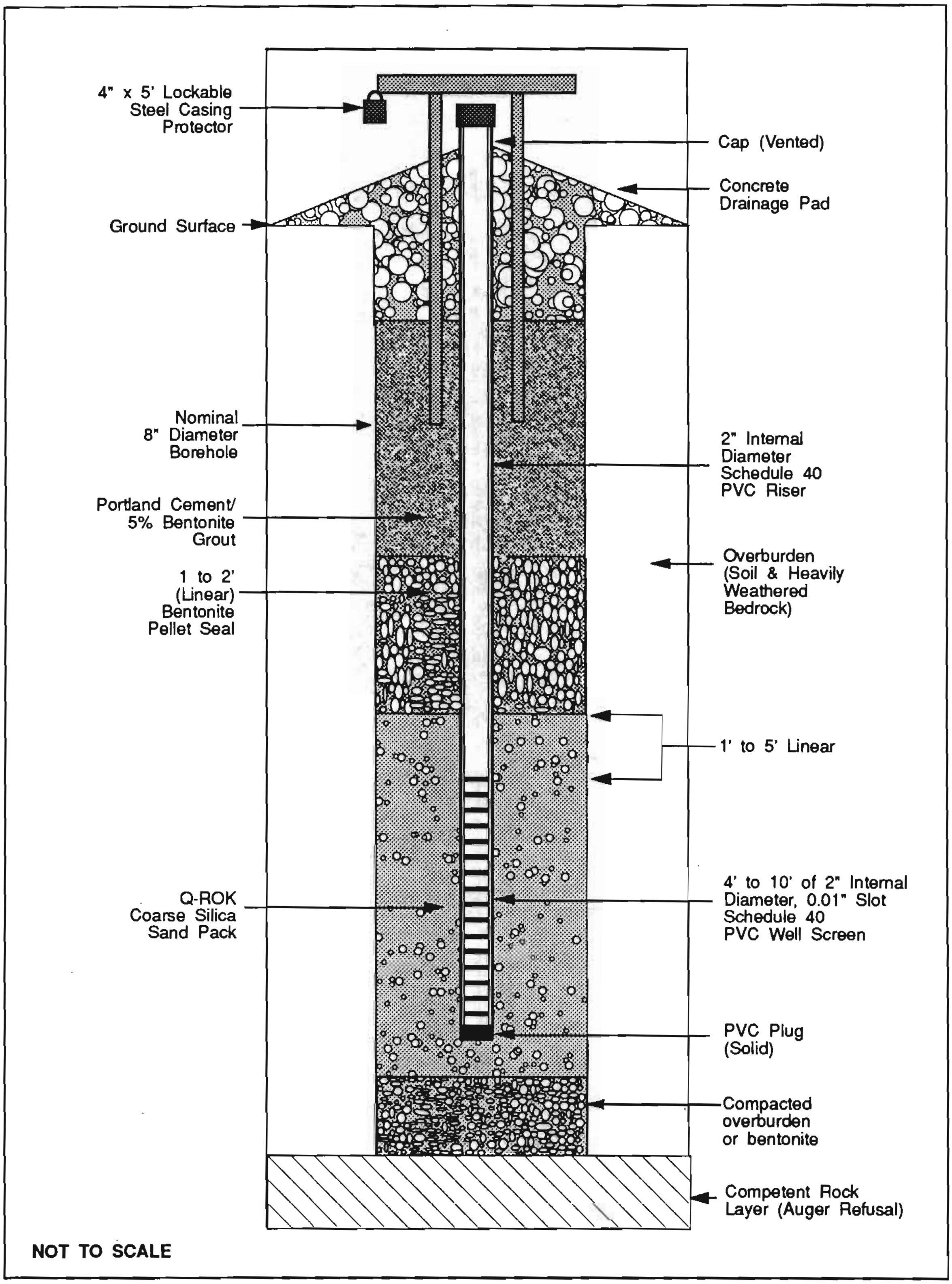

Figure 3-3
SHALLOW MONITORING WELL CONSTRUCTION

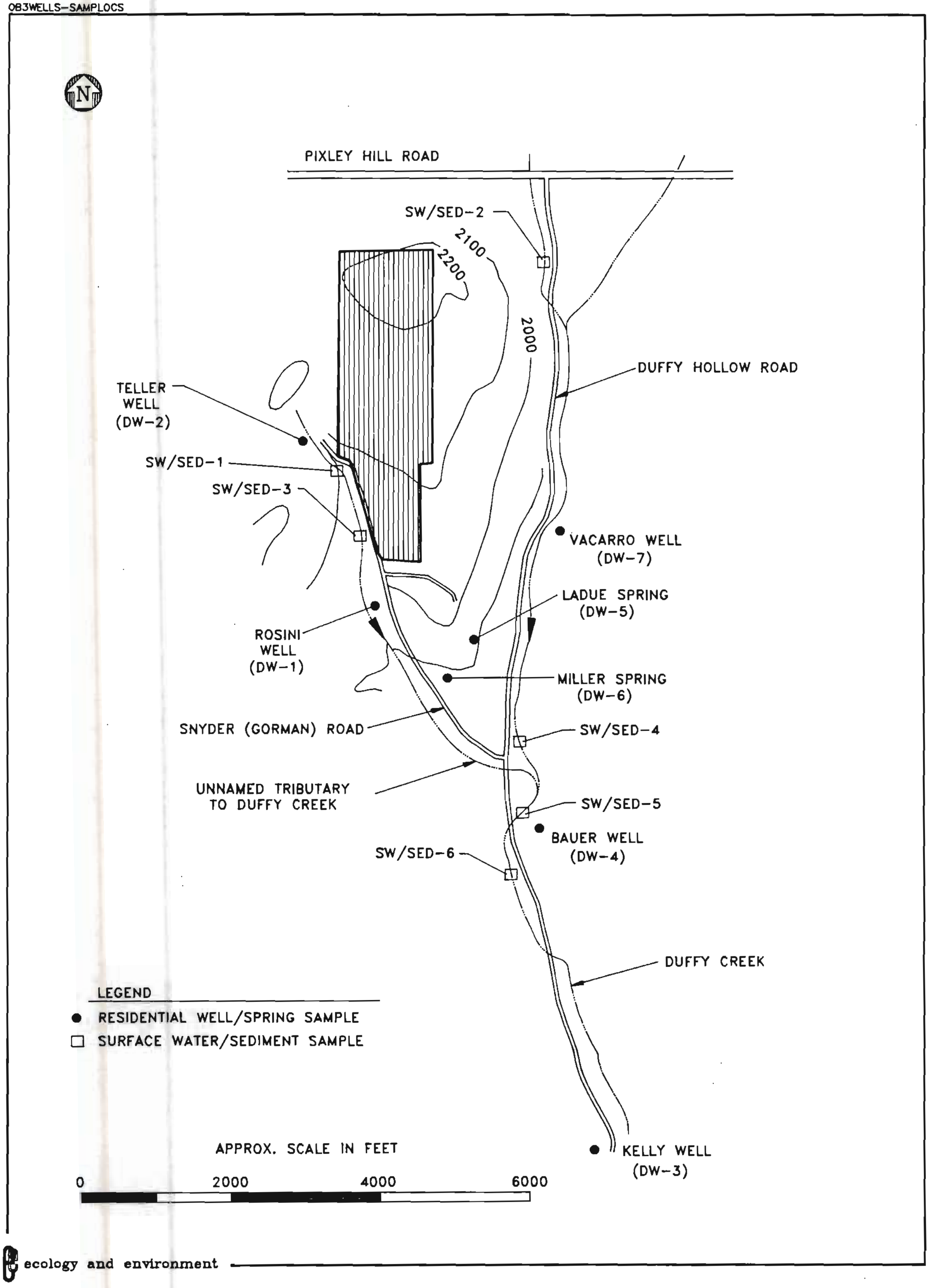

Figure 3–4 RESIDENTIAL WELL AND SPRING, SURFACE WATER, AND SEDIMENT SAMPLE LOCATIONS 1991

4. NATURE AND EXTENT OF CONTAMINATION

4.1 INTRODUCTION

To develop an understanding of the nature and extent of contamination at the Wellsville-Andover Landfill site, this section discusses the primary environmental media that influence contaminant migration, such as geology, surface hydrology, and hydrogeology. This is followed by a discussion of the concentrations and areal extent of contamination that exist in these media.

All analytical data (including field and laboratory samples) are presented on data summary sheets in Appendix D. Tables summarizing the organic and inorganic analytes detected in each sample type are provided in this section.

4.2 SITE GEOLOGY

4.2.1 Introduction

The geology at the Wellsville-Andover Landfill and throughout Allegany County can be subdivided into two primary units. One unit is the Paleozoic sedimentary rocks that underlie all of western New York and northern Pennsylvania. The second unit is a thin overburden of unconsolidated Pleistocene glacial deposits and recent alluvium. Section 2.3 provides a discussion of the regional geology. Site-specific interpretations of the geology at the Wellsville-Andover Landfill site were developed using primarily the following techniques:

- Field observations of soils as well as local bedrock outcrops;
- Interpretation of geophysical surveys;
- Examination of split-spoon samples and rock cores collected during the drilling of the 10 deep monitoring wells;
- Geotechnical analyses performed on selected samples; and
- Review of drilling log records and photos.

Subsurface boring logs were developed for each of the monitoring wells installed during the Phase I RI and are presented in Appendix B. Geologic cross-sections and a groundwater potentiometric surface contour map were generated from data collected from the monitoring wells and are discussed below.

4.2.2 Geophysical Survey Interpretation

Geophysical investigations performed at the site included total earth field magnetics, electromagnetic ground conductivity, and seismic refraction surveys. Data collection methods are described in Section 3.3 of this report.

As discussed in Section 3.3.1, magnetometer data were corrected for diurnal variations and then contoured using Surfer, version 4.10 (see Figure 4-1). Magnetic field strength in undisturbed areas was approximately 55,500 to 56,000 gammas. Anomalous areas of unusually high or low magnetic field strength were then noted for possible trench excavation. Several unusual features were noted on the generated contour map. Among them is the east-west linear feature with high magnetic field strength, located at the north end of the site. This feature correlates with the cut-off ditch at the north end of the filled areas. Since it is unlikely that metallic objects exist below the ditch, it is assumed that the sidewalls of the ditch interfered with the magnetic field. Another linear feature noted on Figure 4-1 occurs along the north side of the northeast fill area. This feature may represent a buried linear object or may again be due to magnetic field interference caused by the sloped embankment of the northeast fill area.

As discussed in Section 3.3.2, Surfer was used to generate contour maps of ground conductivity in both the horizontal and vertical dipole modes of the EM31 (see Figures 4-2 and 4-3). The ground conductivity in undisturbed areas was approximately 5 to 15 micromhos per meter (μMhos/M) in the horizontal dipole mode and approximately 10 to 20 μMhos/M in the vertical mode. The horizontal dipole was especially effective in defining the fill areas. In addition, Figure 4-2 appears to indicate that linear east-west cells were filled in the northeast area, while irregularly shaped cells exist in the other fill areas. Anomalous areas were noted on the contour maps, and those that correlated with magnetic anomalies were selected for trenching. The locations of the trenches are shown on Figure 3-1. The strong anomaly near coordinate 815,1285 on both Figures 4-2 and 4-3 was due to a concrete pad adjacent to the central access road.

As discussed in Section 3.3.3, seismic refraction data were collected around the perimeter of the fill area as well as along two transects across the center of the site (see Figure 1, Appendix A). Data interpretation involved selecting the first-break arrival times from the seismic traces. These measurements represent the arrival times of the primary wave (P-wave) of the seismic energy refracted along layers exhibiting significant velocity contrast. A P-wave is the fastest-propagating type of seismic wave. The number of layers and their associated velocities are determined from the first-break data.

Algorithms from the GRM were used to convert the data from measurements of time to measurements of layer thickness. The approximate accuracy of this method is ±15%. Due to lack of borehole control at the time the survey was performed and analyzed, absolute depth estimates varied. However, the relative changes in bedrock topography interpreted along seismic profiles can be used to evaluate changes in overburden stratigraphy and bedrock topography.

A complete seismic report prepared by Davenport/Hadley, including seismic profiles, is presented in Appendix A. Based upon these results, overburden thickness appears to be consistent with topography with localized variations caused by erosional alteration of the bedrock surface. In general, the seismic data indicate three layers are present. The upper layer ranges in P-wave velocity from 1,090 to 2,220 feet per second (fps), typical of unconsolidated, unsaturated surficial soil. Generally, this layer is less than 10 feet thick. The middle layer ranges in velocity from about 2,090 to 5,400 fps, which is representative of dense soils or weathered rock. Velocities in excess of 5,000 fps represent saturated conditions. Based on subsurface boring information, the middle layer is thought to represent dense soil with many rock fragments derived from the local bedrock. The third layer generally has P-wave velocities in excess of 10,000 fps and was interpreted as competent rock. However, the subsurface boring logs indicate that the third layer may represent an increase in density from dense soil to either very dense soil with structurally intact rock lenses or to relatively competent, yet still highly fractured, bedrock.

4.2.3 Characteristics of the Overburden

As previously described, the Wellsville-Andover Landfill occupies a hill between Duffy Creek and its unnamed tributary. The site slopes generally to the south at approximately 5% to 6%. A description of the soils encountered in the area is provided in Section 2.3.1. In general, the soils consist of glacial till of local derivation underlain by hardpan and soils formed *in situ*.

The nature of the overburden was characterized using the results from the subsurface investigation. Split-spoon sampling was performed in MW-11S and each of the 10 deep wells installed at the site. Split-spoon sampling was performed in accordance with ASTM Designation D1586-84. In general, blow counts recorded during split-spoon sampling indicate mixed soils of varying density; however, the general pattern appears to be medium-density soils (10 to 29 blows/ft) underlain by dense (30 to 49 blows/ft) to very dense (≥50 blows/ft) soils, as expected.

The thickness of overburden at the site does not appear to change with topography; rather, localized bedrock erosional patterns and anthropogenic alterations control overburden thickness. This is seen in the seismic cross sections in Appendix A. In borrow areas, the overburden is artificially thin (9 feet at MW-4D). Overburden thickness in undisturbed areas ranged from about 10 feet in MW-2D to 64 feet in MW-8D.

Nineteen subsurface soil samples were collected at and around the site for geotechnical analyses. All samples were subject to Atterberg limits testing (ASTM D4318), grain size analysis including hydrometer (ASTM D422), and water content analysis (ASTM D2216). The results of these analyses, including classification by the Unified Soil Classifications System (ASTM D2487-85), are presented in Appendix E. In general, the soil samples collected were well graded, with a fairly uniform distribution of gravels, sands, silts, and clays. Ten samples, including those from the north end (MW-1D) and south end (MW-8D) of the site, were classified as sandy lean clay with gravel (CL) or gravelly lean clay with sand (CL). Seven samples from various depths across the site were classified as clayey gravel with sand (GC) or clayey sand with gravel (SC). The general trend is for finer-grained soils (CL) to overlie coarser-grained soils (GC and SC).

One soil sample (CL-1) was collected from the Millers' property south of the site at the same location as the Millers' domestic water sample. At this location, perched water flowed on top of an unsaturated clay and silt layer. This sample contained more clay than any sample collected on site (24%) but contained enough silt (47%) and sand (16%) and was of sufficiently low plasticity to be classified as a silt with sand (ML). The clay portion of this sample has a low enough activity to be considered a mixture of illite and kaolinite (Holtz and Kovacs 1981). The low activity of the clay in the remainder of the samples suggests that most clay found at the site is illite. The presence of the clay- and silt-rich layer, as well as the existence of springs south of the site, suggests that as glacial ice receded from Duffy Hollow, outwash deposits of fine-grained soils were deposited in the area. These low-permeability units create perched water zones that emerge from hillsides as springs.

Trench excavation indicated that local materials were used for cover and that this material also contained a uniform grain-size distribution. Visual classification during trenching indicated the presence of various grain sizes from clay to boulder. Boulders consisted of locally derived sandstone ranging up to an 8-inch thick flagstone 6 feet in diameter.

4.2.4 Bedrock Geology

The characterization of the bedrock was determined from literature published regarding local geology as well as site investigation activities, including the seismic refraction survey and well drilling.

The site lies within the glaciated Allegheny Plateau section of the Appalachian Plateau physiographic province. This area is known locally as the Southwestern Plateau (USDA 1956). The entire region is underlain by Paleozoic sedimentary strata. The bedrock beneath the site is part of the Late Devonian Canadaway Group (Rickard 1975). As described in Section 2.3.2, this group consists of approximately 700 to 1,200 feet of subtidal and peritidal deposits of shale, siltstone, and sandstone. Specifically, the bedrock beneath the site consists of the Wellsville Formation (called the Whitesville Formation to the east and the Forty Bridge to the west) (Rickard 1975). The Wellsville Formation consists of thin sandstones and siltstones, 0.5 to 3 inches thick, interbedded with primarily argillaceous but sometimes arenaceous shales. The formation is generally olive green to gray, weathering to greenish brown or brownish gray. In addition, some brown to dull red beds have been noted in the upper Wellsville. Calcareous shale and siltstone beds are present throughout the section. Many beds exhibit cross-bedding, ripple marks, and mud flows, and many are highly fossiliferous, containing mostly brochiopods (Woodruff 1942).

Definition of the upper bedrock surface at the site is very difficult due to the high degree of weathering of the bedrock as well as erosional irregularities in the surface. Bedrock was encountered in each of the 10 deep wells installed across the site. In general, auger refusal was achieved on a relatively competent, light gray, laminated, calcareous siltstone or fine-grained sandstone ranging in thickness from 1 to 5 feet. However, as indicated by the seismic refraction survey, the former bedrock surface may also be defined by changes in soil density or type; i.e., from glacial till to clays weathered in place from native shale. In many instances, the first competent calcareous siltstone layer encountered was underlain by rock so severely weathered it may be considered soil. Geologic cross-sections of lines AA' and BB' (see Figure 4-4) are provided as Figures 4-5 and 4-6. Cross-section AA' runs N4°E/S4°W along the east side of the site. Cross-section BB' runs N54°W/S54°E across the center of the site. Both cross-sections indicate a complex, interbedded formation, with various layers appearing, disappearing, or lying unconformably on others. This complex interbedding indicates deposition in a very active subtidal and nearshore environment.

The seismic survey indicates that the bottom refractor dips south at approximately 3° to 5°. However, correlation of coal stringers encountered in wells MW-3D, MW-5D, and MW-6D and subsequent correction to an east-west strike (Woodruff 1942) indicates that the bedrock beneath the site dips approximately 1.4° south.

With the exception of the occasional competent sandstone bed, the majority of the bedrock encountered was extremely weathered and very highly fractured. In general, shale beds were more highly fractured and weathered than the silt and sandstone beds, and contained subhorizontal to subvertical fractures. Numerous fractures in a variety of beds were open, with visible oxidation residues present on the fracture surfaces. Horizontal and vertical clay-filled fractures were also encountered across the site. No significant zones of competent bedrock were encountered beneath the fractured zone. Therefore, the potential maximum depth of contaminant migration cannot be determined at this time.

4.3 SITE HYDROLOGY

4.3.1 Surface Water and Runoff

The Wellsville-Andover Landfill occupies a hillside that slopes to the south at approximately 5% to 6%. In addition, the majority of the site dips gently to the southwest toward the unnamed tributary to Duffy Creek. The hillside adjacent to the east side of the site slopes more steeply to Duffy Creek at approximately 14% to 20%. However, due to the presence of a low ridge along the east side of the site, the vast majority of surface water drains toward the unnamed tributary.

Numerous ditches were excavated at the site to divert surface runoff away from the filled areas. The northernmost trench, located approximately 160 feet north of the northeast fill area, runs east-west, diverting flow around the northeast and northwest fill areas. Flow diverted to the east runs via shallow ditches into the drainage collection pond. This pond is meant for temporary storage, as water can drain out to the west via a culvert. Pond overflow drains in a ditch toward the northern access gate. In addition, runoff on the west side of the site flows to the northern access gate, as does runoff from the north central portion of the site. All runoff that reaches the northern access gate flows through a culvert under Snyder Road directly into Duffy Creek's unnamed tributary. Ditches also exist around the perimeters of the south and south-central fill areas. Runoff in these areas is also diverted to the west, eventually ending up in the unnamed tributary via culverts under Snyder Road.

Throughout the field investigation, ponded surface water was present in the drainage collection pond as well as in a small depression adjacent to MW-2S, even when all ditches were dry. This suggests that springs may be present in these areas.

The unnamed tributary that flows along the west side of the site is registered as a Class C water body (6 NYCRR 821.6). This stream is shown to be intermittent by the USGS (1965b), and this was confirmed during surface water sampling. At the time of sampling, the stream consisted only of isolated pools. Duffy Creek, also classified as Class C (6 NYCRR 821.6), consisted primarily of pools connected by very low flow streams at the time of surface water sampling. Detailed characterization of these two streams is provided in Section 6 of this report.

4.3.2 Groundwater Hydrogeology

Groundwater data were collected from the nine bedrock and eight overburden wells installed during the Phase I RI as well as the four pre-existing wells. Water levels were measured in each of the wells after development but prior to sampling in October 1991 and then again in November 1991. These data are presented in Table 4-1.

During drilling and split-spoon sampling, saturated soils were not encountered, except in MW-11S. In this well, the soil became moist to wet at 15 to 16 feet below ground surface

(BGS). Prior to sampling, the water level in MW-11S rose to 5.7 feet BGS. In the remaining wells, alternating zones of wet and dry soils were encountered. In general, the coarser-grained zones (sands and gravels) were drier than the fine-grained zones (clays and silts). The presence of moisture in the slow-draining clays and silts is interpreted as residual moisture from a fluctuating water table. In general, however, moisture was first noticed at 6 to 8 feet BGS in most wells.

After well development but prior to sampling in October 1991, water levels in the overburden wells ranged from 1.1 feet BGS in MW-5S to 17.9 feet BGS in MW-9S. At this same time, water levels in the bedrock wells ranged from 1.3 feet BGS in MW-5D to 64.2 feet BGS in MW-1D. In general, water levels in November 1991 were similar to those in October 1991. Most water levels rose slightly by November, except in MW-1D, MW-2D, and MW-3D, where they dropped slightly, and in MW-9D, MW-10D, MW-10S, CW-3A, and MW-3B, where they dropped from 0.5 to 8.8 feet. In addition, the water level rose significantly (8.2 feet) in MW-3S between October and November 1991.

The water level data indicate that perched water exists in the overburden at and around the site, supporting data collected during well drilling and geotechnical analyses regarding the soils. The presence of springs near the site also supports this theory.

Using the data collected in November 1991, various hydraulic gradients were calculated. Vertical gradients are difficult to interpret at this site and may be misleading due to the presence of perched water. Nonetheless, the vertical gradient was found to be moderately uniform across the site, ranging from 0.3 to 0.6 ft/ft (downward) based on well pairs MW-3D/3S, MW-6D/6S, MW-9D/9S, and MW-10D/10S. The vertical gradient at well pair MW-5D/5S was found to be significantly less than that above (0.01 ft/ft). This pair is relatively close to MW-6D/6S, and the order of magnitude difference in vertical gradients between these two well pairs supports the theory that perched water zones are present in the overburden.

Horizontal hydraulic gradients were calculated based on the November 1991 bedrock well water levels. The average horizontal gradient across the entire site is to the south and was calculated to be 0.04 ft/ft between MW-1D and MW-7D. This is similar to but slightly less than the topographic gradient between these wells (0.05 ft/ft south), suggesting that the potentiometric surface is strongly influenced by topography. At the north end of the site, the horizontal hydraulic gradient is approximately 0.03 ft/ft south as calculated between MW-1D and MW-10D, MW-3D, and MW-2D. This is less than the topographic gradient of 0.06 ft/ft in this area. At the south end of the site, the horizontal gradient increases to a maximum of 0.10 ft/ft between MW-6D and MW-7D, which is greater than the topographic gradient between these wells (0.07 ft/ft). In some areas, the horizontal hydraulic gradient is reversed. For example, between MW-2D and MW-4D, the gradient is 0.01 ft/ft to the north, indicating the presence of a groundwater divide.

Contouring of water surface elevations for the bedrock wells indicates that groundwater flow mimics topography with a general flow direction in the northern and central portions of the site to the south-southwest (see Figure 4-6). An exception to this is seen on the west side of the site, where groundwater flows southwest toward the unnamed tributary to Duffy Creek. Additionally, flow at the south end of the site is directed more to the south. The contours also indicate that a groundwater divide exists on the east side of the site trending approximately north to N7°W. The presence of this divide is also supported by the reversal in horizontal hydraulic gradient between wells MW-2D and MW-4D, and MW-2D and MW-3D. Groundwater flow on the east side of the site is to the east, following the steep topographic gradient down to Duffy Creek. Some of this flow likely emerges as the springs present on the lower hillside between the site and Duffy Creek.

Due to the presence of complicating perched zones, a contour map of groundwater flow in the overburden is not included. However, comparison of water levels suggests that groundwater flow in the overburden is similar to the flow depicted in the bedrock.

Based on the water level data as well as subsurface boring logs, the overburden and bedrock beneath the site are interpreted as being one continuous aquifer. That is, no confining layer was found to be consistently present between the overburden and bedrock, and groundwater appears to be able to pass freely from one medium to the next. Low permeability zones of clayey silt are present throughout the overburden in the area as discussed; however, they appear to be discontinuous, creating perched but unconfined water-bearing zones. The springs in the area are interpreted as resulting from the convergence of these perched zones just beneath the ground surface.

Generally, groundwater flow in the overburden is restricted vertically by clay and silt lenses but is facilitated in sandy and gravelly zones. In the bedrock, the major component of flow appears to be the result of secondary porosity features of the bedrock--i.e., fractures and joints. Open and clay-filled fractures of all orientations were observed in both arenaceous and argillaceous beds, indicating that water can flow both horizontally and vertically and is generally unrestricted by usually confining shale beds. Interstitial flow due to the primary porosity of the bedrock is expected to be a relatively minor component. Interstitial pore flow is most likely restricted both horizontally and vertically by the presence of shale beds.

4.4 EXTENT OF CONTAMINATION OF ENVIRONMENTAL MEDIA

The following sections include a summary of the chemical contamination discovered at the Wellsville-Andover Landfill site during the Phase I RI between August and December 1991. The following media were sampled in order to assess the extent of contamination on and off the site:

- Subsurface soil and waste from trenches;
- Subsurface soil from borings;
- Groundwater;
- Residential wells and springs;
- Surface water;
- Sediment;
- Surface soil;
- Leachate; and
- Air.

Tables 4-2 through 4-21 contain a summary of the analytical data for the various media sampled. Appendix D contains a tabulation of all analytical results including tentatively identified compounds (TICs).

All of the analytical data were independently qualified and then reviewed by E & E prior to reporting. A discussion of the data qualification is presented in Section 4.5 of this report. In general, common laboratory contaminants including methylene chloride, acetone, and phthalate compounds are not discussed in this section when these compounds were detected in the field samples at concentrations similar to those in the method blanks.

4.4.1 Subsurface Soil/Waste Samples From Trenches

As discussed in Section 3.4, five trenches were excavated at the site, the locations of which were based upon the geophysical surveys performed. One soil/waste sample was collected from each trench shown in Figure 3-1. A description of the samples (TP-1 to TP-5) is provided in Table 3-2.

Trench 1 was excavated on December 19, 1991 in the northwest corner of the northwest fill area. The top 1.5 feet consisted of brown channery loam of local derivation consisting of clay- to boulder-sized material. This was underlain by approximately 1.5 feet of gray clay and silt containing large sandstone fragments. Municipal trash was encountered at 3 to 4 feet and continued down to at least 15 feet. No cause for the geophysical anomaly was observed, so a second trench was excavated 10 feet north of the first. In both, water was found to flow into the excavation at approximately 5 feet below grade. In the second excavation, two 55-gallon drums were encountered at approximately 6 feet. These drums were heavily rusted and contained a black liquid that may or may not have been groundwater that entered the breached drums. Sample TP-1 was collected from soil adjacent to the drums on which the liquid had spilled. No markings were noted on the drums.

Trench 2 was excavated on December 19, 1991 in the central portion of the northeast fill area. The cover material consisted of only about 1.5 feet of brown channery loam of local derivation containing clay- to boulder-sized material. This trench was excavated to 7 or 8 feet, and only municipal trash was encountered. The source of the geophysical anomaly was determined to be numerous metal objects, including a steel trash can, an aluminum storm door, a roll of steel chicken wire, and copper tubing. Sample TP-2 was collected from this trench and consisted of soil composited from the full length of the trench at about 5 to 6 feet below grade.

Trench 3 was excavated on December 18 and 19, 1991 near the southeast corner of the northwest fill area. At this location, approximately 3 feet of cover material was encountered, consisting of medium brown and dark gray channery loam (clay- to boulder-sized material). Municipal trash in an ash-like matrix was encountered at 3 to 4 feet. Water was found to enter the trench at 4 and 6 feet. Excavation of the trench was completed the morning of December 19, 1991, and water had filled the trench to about 1.5 feet below grade by the next morning. The source of the geophysical anomaly was determined to be a large piece of scrap metal at 6 feet as well as numerous truck tire rims. Sample TP-3 consisted of a mixture of the soil and ash-like substance collected at about 6 feet.

Trench 4 was excavated on December 18, 1991 in the northeast corner of the south-central fill area. The cover material at this location consisted of about 2 to 2.5 feet of medium brown channery loam (clay- to boulder-sized material). Immediately below the cover, five heavily rusted and dented 55-gallon drums were encountered along the 15- to 20-foot length of the trench. These drums, which were all lying on their sides in the same orientation, contained a pink, white, gray, and brown mottled solid material. This material seemed to be a low-density plastic with many air bubbles. No markings were observed on the drums; however, the soil around the drums contained more than 50% plastic buttons and plastic scraps from which these buttons were apparently punched. Sample TP-4, composited from all five drums, consisted of soil, plastic scraps, and small fragments of the plastic-like material from the drums.

Trench 5 was excavated on December 17 and 18, 1991 in the central portion of the south fill area. The cover consisted of about 2 feet of brown channery loam (clay- to boulder-sized material). This trench contained municipal trash as well as construction and demolition debris. The source of the geophysical anomaly was found to be a car fender, a roll of steel barbed wire, and one empty, crushed 55-gallon drum marked "oil," all of which were found at less than 6 feet below grade. Water was found to enter the trench at approximately 4 feet and had a very slight oil sheen. Sample TP-5 was collected from the soil and waste below the crushed drum where water entered the trench.

Samples TP-1 through TP-5 were analyzed by E & E's ASC for full TCL parameters according to NYSDEC CLP methods. Sample preservation, shipping, and handling procedures were performed in accordance with the QAPjP. For QC purposes, additional sample volume was collected with TP-5 for MS/MSD analyses.

The organic compounds detected in the samples collected are included in Table 4-2. Numerous VOCs were detected in the samples including ketones, aromatic hydrocarbons, and chlorinated alkenes and alkanes. Acetone, a common laboratory contaminant, is included in Table 4-2 because it was detected in four of the samples but not in the laboratory method blank. However, even the relatively high acetone concentration in TP-1 may be due to laboratory contamination because this sample was analyzed as a medium-concentration sample, which amplifies the amount of laboratory contaminants, such as acetone, detected. Other ketones detected include 2-butanone and 2-hexanone in TP-1 and TP-5, and 4-methyl-2-pentanone in TP-1 only.

Several aromatic hydrocarbons were detected in the samples. Benzene was detected in TP-5 only, at an estimated concentration of 78 μg/kg. Ethylbenzene was detected in all five samples at estimated concentrations ranging from 31 μg/kg in TP-2 to 33,000 μg/kg in TP-1. Toluene was also detected in all five samples, ranging from an estimated 11 μg/kg in TP-2 to 3,200 μg/kg in TP-4. Styrene was detected in two samples only: 45 μg/kg in TP-1 and 4,200 μg/kg in TP-4. Xylenes were detected in all samples except TP-3, ranging from an estimated 51 μg/kg in TP-2 to 1,700 μg/kg in TP-1.

Several chlorinated aliphatic compounds were also detected in the trench samples. 1,1-Dichloroethane (1,1-DCA) was detected in TP-1 at 710 μg/kg. Total 1,2-dichloroethene (total 1,2-DCE) was detected in all samples except TP-2, ranging from an estimated 21 μg/kg in TP-5 to 3,900 μg/kg in TP-1. Tetrachloroethene (PCE) was detected in TP-4 only, at an estimated concentration of 520 μg/kg. TCE was detected in TP-1 at 73 μg/kg and TP-4 at 5,300 μg/kg. Vinyl chloride (VC) was detected in TP-1 only, at an estimated concentration of 980 μg/kg. MC, a common laboratory contaminant, is included in Table 4-2 because it was detected in TP-5 at concentrations significantly higher than in the associated method blank.

Several semivolatile organic compounds were detected in the trench samples, including phthalates, polynuclear aromatic hydrocarbons (PAHs), and phenols. Five phthalates were detected in the samples. While these compounds are common laboratory and field contaminants, most of the concentrations detected are higher than would be expected for background contamination. Bis(2-ethylhexyl)phthalate was detected in all samples except TP-3, ranging from an estimated 1,100 μg/kg in TP-1 and TP-2 to 8,300 μg/kg in TP-4 and TP-5. Butylbenzylphthalate was detected at 16,000 μg/kg in TP-2 and estimated concentrations of 1,000 and 2,700 μg/kg in TP-4 and TP-5, respectively. Di-n-butylphthalate was detected in all samples except TP-1 and TP-3, ranging from an estimated 270 μg/kg in TP-2 to 14,000 μg/kg in TP-4. Diethylphthalate was detected only in TP-1 and TP-3 at estimated concentrations of 110 and 25 μg/kg, respectively. Dimethylphthalate was detected only in TP-4 and TP-5, at estimated concentrations of 910 and 530 μg/kg, respectively.

Numerous PAHs were detected in samples TP-1, TP-2, and TP-5, but none was detected in TP-3 or TP-4. Benzo(b)fluoranthene, benzo(a)pyrene, and chrysene were detected in sample TP-2. 2-Methylnaphthalene and napthalene were detected in TP-2 and TP-5. Fluoranthene, phenanthrene, and pyrene were detected in samples TP-1, TP-2, and TP-5. Concentrations of individual PAHs ranged from an estimated 130 μg/kg (phenanthrene in TP-1) to approximately 720 μg/kg (fluoranthene in TP-2).

Several phenolic compounds were also detected in the trench samples. 4-Chloro-3-methylphenol was found only in TP-2, at approximately 300 μg/kg. 4-Methylphenol was detected in all of the samples except TP-4, ranging from an estimated 370 to 1,600 μg/kg. Pentachlorophenol was detected only in TP-5, at approximately 6,600 μg/kg.

In addition to the above compounds, benzyl alcohol was detected in TP-4 at approximately 1,200 μg/kg, and 1,2-dichlorobenzene was detected in TP-4 and TP-5 at estimated concentrations of 1,200 and 670 μg/kg, respectively.

No PCBs were detected in any of the five samples; however, several pesticides were detected at low concentrations in TP-1, TP-2, and TP-5. Sample TP-1 was found to contain beta-BHC at approximately 12 μg/kg, and TP-5 contained 4,4'-DDD at 120 μg/kg. TP-2 was found to contain dieldrin; 4,4-'DDE; 4,4'-DDD; and 4,4'-DDT at estimated concentrations ranging from 13 to 130 μg/kg.

Table 4-3 summarizes the inorganic analytes detected in the trench samples. Of the 24 inorganics analyzed for, 17 were detected. Concentrations of metals in the trench samples were compared to the common range detected in eastern United States soils as well as to the upper limit of the 90th percentile in order to preliminarily screen the metals of interest (Shacklette and Boerngen 1984). The upper limit of the 90th percentile, indicating the value below which 90% of background samples should fall, was calculated using the following formula:

$$\text{90th percentile} = M*D^{1.282}$$

where:

> M is the geometric mean, D is the geometric standard deviation, and 1.282 is the alpha value pertaining to the 90th percentile, provided in Shacklette and Boerngen (1984).

Aluminum, barium, beryllium, calcium, chromium, iron, manganese, potassium, sodium, and vanadium were detected in all five samples but at concentrations within the 90th percentile for eastern U.S. soils. Arsenic exceeded the 90th percentile only in TP-1 at an estimated 20.9

mg/kg. Cobalt exceeded the 90th percentile in all samples, ranging from 20.8 to 28.1 mg/kg. Copper exceeded the 90th percentile in TP-3 at 194 mg/kg. Elevated concentrations of lead were detected in all samples except TP-3 and ranged from approximately 15.3 mg/kg in TP-3 to about 86.9 mg/kg in TP-4. Nickel exceeded the 90th percentile in TP-1 only, at a concentration of 43.2 mg/kg. Zinc exceeded the 90th percentile in all samples except TP-4 and ranged from approximately 87.4 mg/kg in TP-4 to an estimated 269 mg/kg in TP-3. While many of the above metals exceeded the upper limit of the 90% percentile, none exceeded the observed range. In addition, no cyanide was detected in any of the samples.

In summary, TP-1 contained five metals above the 90th percentile for common eastern U.S. soils, while the remaining samples contained three such metals. Cobalt was detected at elevated concentrations in all samples but with a small difference between concentrations. This suggests that cobalt may be naturally abundant in the area. Chlorinated aliphatics were detected in four of the five samples, ranging from 21 µg/kg in TP-5 to 8,720 µg/kg in TP-4. Aromatic hydrocarbons were detected in all five samples and ranged from 93 µg/kg in TP-2 to 35,900 µg/kg in TP-1. PAHs were detected in three of the five samples, with the highest total concentration (3,170 µg/kg) detected in TP-2. Phthalates, detected in all of the samples, ranged from 204 µg/kg in TP-3 to 24,200 µg/kg in TP-4. Phenols ranged up to 6,870 µg/kg in TP-5. Pesticides, detected in three samples, ranged up to 201 µg/kg in TP-2.

4.4.2 Subsurface Soil Samples From Borings

As discussed in Section 3.5.3, 20 subsurface soil samples were collected during boring of the 10 deep monitoring wells. Samples from wells MW-1D, MW-6D, MW-7D, and MW-8D were analyzed for full TCL organic substances and inorganic substances, while samples from MW-2D, MW-3D, MW-4D, MW-5D, MW-9D, and MW-10D were analyzed for TCL VOCs and inorganic substances only. All analyses were performed according to NYSDEC CLP methods. Tables 4-4 and 4-5 summarize the organic and inorganic analytes detected in the subsurface soil samples, respectively.

VOCs were detected only in the soil samples collected from monitoring well MW-5D. Three chlorinated aliphatic compounds were detected in samples SB-5B and SB-5C. Sample SB-5B, collected from 8 to 9 feet below grade, contained total 1,2-DCE at 87 µg/kg, TCE at 22 µg/kg, and VC at 21 µg/kg. Sample SB-5C, collected from 18 to 19 feet below grade, contained 61 µg/kg of total 1,2-DCE, 13 µg/kg of TCE, and an estimated 7 µg/kg of VC. No semivolatile substances, PCBs, or pesticides were detected in any of the samples analyzed for those compounds.

Of the 24 inorganic analytes tested, 19 were detected in at least one subsurface soil sample. Concentrations of the metals detected were compared to the common range detected in eastern U.S. soils as well as to the upper limit of the 90th percentile (Shacklette and

Boerngen 1984). Aluminum, barium, beryllium, chromium, copper, iron, potassium, sodium, vanadium, and zinc were detected in all or most of the samples, but all at concentrations within the 90th percentile. Cadmium was detected above the contract required detection limit (CRDL) only in SB-2A and SB-10A, and mercury was detected only in SB-8B; however, all three concentrations were within the 90th percentile.

Arsenic, which was detected in all subsurface soil samples, exceeded the 90th percentile in samples SB-3A, SB-9A, and SB-9B at concentrations of 16.4 (estimated), 17.4, and 17.9 mg/kg, respectively. Calcium and magnesium, both detected in all samples, exceeded the 90th percentile in sample SB-10B only, at concentrations of 77,500 and 17,100 mg/kg, respectively. Cobalt, detected in all samples, exceeded the 90th percentile in all samples except SB-10B (including both background samples). Cobalt concentrations ranged from 14.5 to only 33.2 mg/kg, indicating a possible natural abundance of this metal in the area. Lead was detected in all samples except SB-4A, exceeding the 90th percentile in SB-6B and SB-10A at estimated values of 35.6 and 45.3 mg/kg, respectively. Manganese, detected in all samples, exceeded the 90th percentile in SB-4A only, at 1,670 mg/kg. Nickel, also detected in all samples, exceeded the 90th percentile in SB-1A, SB-4A, SB-4B, SB-6A, SB-7A, and SB-7B, with the highest concentration, 53.4 mg/kg, detected in background sample SB-1A. No cyanide was detected in any of the subsurface soil samples.

In summary, organic compounds were detected only in the subsurface soil samples from MW-5D and consisted of the three chlorinated aliphatics of primary concern at this site. In terms of inorganic substances, no sample contained more than three metals above the 90th percentile for typical eastern U.S. soils, including cobalt, which appears to be naturally abundant. Of those metals above the 90th percentile, none exceeded the common range detected in eastern U.S. soils (Shacklette and Boerngen 1984).

4.4.3 Groundwater Samples

As discussed in Section 3.5.4, groundwater samples were collected from the 17 newly installed monitoring wells and the four pre-existing wells. All samples were unfiltered and were analyzed for full TCL organic substances and inorganic substances according to NYSDEC CLP methods, with the exception of GW-2S, GW-9S, and GW-12S, which, due to insufficient sample volume, were analyzed for TCL VOCs and inorganic substances only. Tables 4-6 and 4-7 summarize the organic substances and inorganic substances detected in the groundwater samples, respectively. Table 4-8 summarizes the sampling parameters pertaining to the groundwater samples. All samples remained unfiltered; therefore, the suspended sediment in each well was allowed to settle out prior to sampling, as discussed in Section 3.5.4. By doing so, the metals portion of 10 samples had a turbidity below 50 NTU, and all but three samples had turbidities below 250 NTU. The high turbidities of samples GW-2S and GW-9S were due to the small amount of water in these wells.

Several organic substances, including aromatic hydrocarbons and chlorinated aliphatic compounds, were detected in various groundwater samples. Acetone was detected in GW-3S at 33 μg/L. While acetone is a common laboratory contaminant, it is included in Table 4-6 because it was not detected in the method blank related to GW-3S. However, based on the low concentration and its presence in GW-3S alone, the acetone is assumed to result from laboratory contamination. One trihalomethane was detected in the groundwater samples--chloroform in GW-9S--but at a concentration below the NYSDEC Class GA standard.

Several chlorinated aliphatic compounds were detected across the site. Chloroethane was detected above the Class GA standard in GW-11S at an estimated concentration of 8 μg/L. 1,1-DCA was detected above the Class GA standard in samples GW-5D and GW-5S at estimated concentrations of 6 and 11 μg/L, respectively. 1,1-DCE was detected above the standard in samples GW-5D, GW-5S, GW-11S, and GW-11SDD at estimated concentrations ranging from 9 to 12 μg/L. 1,1-DCE was also detected below the standard in GW-2D. Total 1,2-DCE was detected at or above the standard in samples GW-2D, GW-5D, GW-5S, GW-6D, GW-6S, GW-11S, GW-11SDD, and GW-12D at estimated concentrations of 5 to 5,600 μg/L. In addition, total 1,2-DCE was detected below the standard in GW-10D, GW-12S, and GW-13D. MC was detected only in GW-12D, below the Class GA standard. This compound is a common laboratory contaminant but is included in Table 4-6 because it was not detected in the method blank associated with GW-12D. 1,1,1-Trichloroethane (1,1,1-TCA) was detected only in GW-2D and GW-5S, both at levels below the Class GA standard. TCE was detected above the standard in GW-2D, GW-5D, GW-5S, GW-6D, GW-11S, GW-11SDD, and GW-12S at concentrations ranging from 38 to 1,200 μg/L. TCE was also detected below the standard in GW-3D, GW-4D, and GW-10D. VC was detected above the Class GA standard in samples GW-2D, GW-5D, GW-5S, GW-6D, GW-11S, GW-11SDD, and GW-12D at concentrations ranging from an estimated 45 to 2,100 μg/L.

Two aromatic hydrocarbons were also detected at the site. Ethylbenzene was detected below the standard in GW-5D, and toluene was detected at or above the standard in GW-5D, GW-5S, and GW-12S at concentrations ranging from 5 to an estimated 9 μg/L.

No semivolatile substances, PCBs, or pesticides were detected in any of the groundwater samples analyzed.

Of the 24 inorganic substances analyzed for, 17 were detected in the groundwater samples. Aluminum, arsenic, barium, beryllium, calcium, cobalt, copper, nickel, potassium, vanadium, and zinc were detected in various samples across the site, as detailed in Table 4-7, but all at concentrations below Class GA standards. Chromium, detected only in seven samples including the background, exceeded the standard only in GW-2S at 110 μg/L. Iron was detected and exceeded the standard in all samples, including the background, at concentrations ranging from 316 to an estimated 110,000 µg/L. Lead was detected in all but eight samples and exceeded the standard in GW-2S and GW-12S at an estimated 38.1 and 125 µg/L, respectively. Magnesium was detected in all samples but exceeded the Class GA guidance value only in GW-2S and GW-8S at 50,500 and 56,000 µg/L, respectively. Manganese was detected in all samples, exceeding the standard in 15 samples at concentrations ranging from 387 to 8,530 µg/L. Sodium was also detected in all the samples and exceeded the standard in 12 samples at concentrations ranging from 20,400 to 516,000 µg/L. No cyanide was detected in any sample.

The high inorganic content in many of the wells, especially GW-2S, is most likely a result of the high turbidity of those samples. In terms of organic substances, the two most contaminated wells are MW-5D and MW-5S, with total VOC concentrations of approximately 6,300 and 8,100 µg/L, respectively.

4.4.4 Residential Well and Spring Samples

As discussed in Section 3.6, water samples were collected from five residential wells and two springs. All samples were analyzed for TCL semivolatile substances, PCBs, pesticides, metals, and cyanide according to NYSDEC CLP methods, as well as volatiles by EPA Method 524.2. Tables 4-9 and 4-10 summarize the organic and inorganic analytes detected, respectively. At the time of sampling, conductivity, temperature, and turbidity data were collected for each of the samples. These data are presented in Table 4-11.

The only volatile substance detected in the samples collected, other than those attributable to laboratory contamination, was TCE. This chlorinated aliphatic compound was detected only in water from the LaDue spring (DW-5) at 2.6 µg/L. TCE was also detected in the field duplicate collected at the LaDue spring (DW-5D) at 2.9 µg/L. No semivolatile substances, PCBs, or pesticides were detected in any of the samples.

Of the 24 inorganic analytes tested for, 14 were detected in the residential water samples. Aluminum, barium, calcium, magnesium, and potassium were detected in all the samples at concentrations below NYSDEC Class GA standards and guidance values and New York State Department of Health (NYSDOH) Maximum Contaminant Levels (MCLs). Chromium, copper, lead, mercury, and cyanide were detected in some of the samples, but none was detected at concentrations exceeding NYSDEC Class GA standards or NYSDOH MCLs.

Iron, present in all but DW-2, exceeded the Class GA standard and MCL in DW-1, DW-3, DW-4, DW-5, and DW-6 at concentrations ranging from 534 to 1,300 µg/L. Manganese, present in all samples, exceeded the Class GA standard and MCL in DW-1 only, at 510 µg/L. Iron and manganese are both considered secondary contaminants by NYSDOH, with MCLs based on aesthetic quality. Both are also commonly high in unfiltered groundwater samples.

Sodium, present in all samples, exceeded the NYSDEC Class GA standard in samples DW-1, DW-3, DW-4, and DW-7 at concentrations ranging from 31,600 to 58,000 µg/L. No MCL for this secondary contaminant exists; however, the sodium content in the above four samples exceeds the guideline for people on severely restricted sodium diets. No sodium concentrations exceeded guidelines for people on moderately restricted sodium diets (10 NYCRR 5-1.52).

Zinc, detected in all samples, exceeded the NYSDEC Class GA standard in DW-4 only, at a concentration of 338 µg/L. However, this concentration is below the MCL for this secondary contaminant.

4.4.5 Surface Water Samples

As discussed in Section 3.7, six surface water samples plus one field duplicate were collected from Duffy Creek and its unnamed tributary. Two samples were collected from Duffy Creek (SW-2 and SW-4), two were collected from its tributary (SW-1 and SW-3) upstream of their confluence, and two were collected downstream of the confluence (SW-5 and SW-6). All samples were analyzed for full TCL organic substances and inorganic substances. Tables 4-12 and 4-13 summarize the organic substances and inorganic substances detected in the surface water samples, respectively.

No VOCs other than common laboratory contaminants were detected in the surface water samples. Two semivolatile compounds were detected in the samples. Di-n-butylphthalate was detected at low concentrations in SW-1, SW-2, SW-4, and SW-6. In addition, di-n-octylphthalate was detected at a low concentration in SW-2. Phthalates are common laboratory contaminants but are included here because neither was detected in the method blank associated with these samples. Phthalates are also common field contaminants resulting from rubber-based protective clothing. The phthalates detected in the downstream samples are assumed not to be site-related because they were also detected upstream (SW-2).

No PCBs or pesticides were detected in any of the surface water samples.

Of the 24 inorganics analyzed for, 13 were detected in the samples. Barium, calcium, magnesium, manganese, potassium, sodium, vanadium, and zinc were present in most or all of the samples analyzed but at concentrations below NYSDEC Class C standards. Aluminum was present in all samples and exceeded the Class C standard in all samples except SW-6, collected the furthest downstream of the site. Aluminum concentrations ranged from 119 to 578 µg/L in the samples, exceeding the Class C standard, and was present at 307 µg/L in the background sample from Duffy Creek (SW-2). Copper and nickel were both detected only in the background sample (SW-2), and both were detected at concentrations below Class C standards. Iron was detected in all seven samples, exceeding the standard in all except SW-4 and SW-6. The highest concentration of iron was detected in SW-2, the background sample (estimated to be 3,840 µg/L). Lead was detected in all seven samples, ranging from estimated concentrations of 1.1 to 4.9 µg/L. The Class C standard for lead was exceeded in samples SW-3, SW-4, SW-4D, and SW-5 but not in the sample closest to the site (SW-1) nor furthest downstream (SW-6).

The surface water samples were also analyzed for hardness, as indicated on Table 4-13. All seven samples fall near the border between soft and moderately hard water.

4.4.6 Sediment Samples

As discussed in Section 3.7, sediment samples were collected from six locations in Duffy Creek and its unnamed tributary. These samples were collected from the same locations as the surface water samples discussed in Section 4.4.5. Tables 4-14 and 4-15 summarize the organic and inorganic analytes detected in the sediment samples, respectively.

The only VOC detected in any of the sediment samples was acetone which was present in all samples except SED-6 at concentrations ranging from approximately 10 to 38 µg/kg. Acetone is a common laboratory contaminant but is discussed here because it was not detected in the associated method blank. However, due to the low concentrations detected, as well as its presence in the upstream sample (SED-2), the presence of acetone in these samples is assumed to be due to laboratory contamination.

The only semivolatile substances detected was butylbenzylphthalate in sample SED-3 at an estimated concentration of 24 µg/kg. Phthalates are common field and lab contaminants resulting from rubber-based protective clothing. No sediment criteria exist for either acetone or butylbenzyl phthalate (NYSDEC 1989).

No PCBs or pesticides were detected in any of the sediment samples.

In addition to the above analyses, the sediment samples were also analyzed for organic matter according to ASTM Designation D2974-87. The results, which are presented in Table 4-14, ranged from 3.2 to 7.3%.

Of the 24 inorganics analyzed for, 17 were detected in the sediment samples. Aluminum, barium, beryllium, calcium, chromium, cobalt, lead, magnesium, potassium, and vanadium were detected in all seven samples at concentrations below the sediment criteria. Sodium, detected only in SED-2, has no applicable criterion. Arsenic, detected in all samples at concentrations ranging from 8.1 to 14.3 µg/kg, exceeded the sediment criterion but not the limit of tolerance in all samples, including the background sample (SED-2). Copper was detected in all of the sediment samples at concentrations ranging from 15.7 to 23.0 µg/kg and exceeded the criteria, but not the limit of tolerance, in SED-1, SED-4, and SED-4D. Iron exceeded the sediment criterion in all samples, with concentrations ranging from 31,600 to 43,200 µg/kg. Iron also exceeded the limit of tolerance in SED-2, the background sample, and in SED-6. Manganese exceeded the sediment criterion in all samples, with concentrations ranging from 705 to 2,440 μg/kg, and it exceeded the limit of tolerance in samples SED-1, SED-2, SED-3, and SED-5. The highest concentrations of iron and manganese were detected in the background sample SED-2, suggesting that the presence of these metals at high concentrations is not site-related.

Nickel exceeded the sediment criterion but not the tolerance limit in all of the samples, with concentrations ranging from 33.4 to 42.2 μg/kg. Zinc, detected in all samples, exceeded the criterion in SED-2, SED-3, and SED-4D, but not the tolerance limit. The background sample, SED-2, contained one of the highest concentrations of zinc.

4.4.7 Surface Soil Samples

As discussed in Section 3.8, two background (SS-1 and SS-2) and twelve biased (SS-3 through SS-14) surface soil samples were collected at and around the site. All 14 samples were analyzed for full TCL organic substances and inorganic substances according to NYSDEC CLP methods. Tables 4-16 and 4-17 summarize the organic and inorganic analytes detected in the surface soil samples, respectively.

Three VOCs were detected in the surface soil samples. Acetone was detected in one sample (SS-11) at a concentration that was not directly attributable to laboratory contamination. Chloromethane was detected in SS-7 at an estimated concentration of 40 μg/kg, and ethylbenzene was detected in SS-6 and SS-7 at estimated concentrations of 1 and 18 μg/kg, respectively. No other chlorinated aliphatic compounds were detected in any of the surface soil samples.

Several semivolatile compounds, including phthalates and PAHs, were detected in several soil samples. Two phthalate compounds were detected at concentrations not directly attributable to laboratory contamination, including bis(2-ethylhexyl)phthalate at 2,100 μg/kg in SS-3 and butylbenzylphthalate at estimated concentrations of 50 and 260 μg/kg in SS-10D and SS-13, respectively. Phthalates are common laboratory and field contaminants due to their presence in rubber gloves and other protective equipment.

As summarized in Table 4-15, several PAHs were detected in numerous samples. The total estimated PAH concentrations in these samples are 53 μg/kg in SS-3; 160 μg/kg in SS-7; 40 μg/kg in SS-9; 980 μg/kg in SS-10; 140 μg/kg in SS-12; and 410 μg/kg in SS-14. Individual PAHs found to exceed typical ranges detected in rural soils (ASTDR 1989) include benzo(b)fluoranthene in SS-10 and SS-14; chrysene in SS-10 and SS-14; fluoranthene in SS-7 and SS-10; indeno(1,2,3-cd)pyrene in SS-12; phenanthrene in SS-7, SS-10, and SS-14; and pyrene in SS-3, SS-7, SS-10, and SS-14.

No PCBs or pesticides were detected in any of the surface soil samples.

Of the 24 inorganic analytes tested for, 18 were detected in the surface soil samples. Concentrations of metals in the surface soil samples were compared to the common range detected in eastern United States soils as well as to the upper limit of the 90th percentile (Shacklette and Boerngen 1984).

Aluminum, arsenic, barium, beryllium, chromium, copper, magnesium, potassium, sodium, and vanadium were detected in all or most samples but at concentrations within the observed range and 90th percentile.

The concentrations of calcium in SS-3 and SS-9 were found to exceed the 90th percentile but fell within the observed range. Cobalt was detected at concentrations exceeding the 90th percentile in all samples except background sample SS-2 (including background sample SS-1). However, all cobalt concentrations fell within the observed range except in SS-11, where it was detected at 87.3 mg/kg. Iron was found to exceed the upper limit of the 90th percentile in SS-3, SS-10, SS-10D, and SS-11 at concentrations ranging from 54,300 to 283,000 mg/kg. Lead was found to exceed the 90th percentile in SS-3 and SS-11 at 35.5 and 56.1 mg/kg, respectively, while manganese exceeded this limit in SS-3 and SS-13 at estimated concentrations of 4,540 and 1,940 mg/kg, respectively. Nickel exceeded the 90th percentile in SS-3, SS-6, SS-7, and SS-11 at concentrations ranging from 39.4 to 88.0 mg/kg. Zinc was detected above the 90th percentile in SS-3, SS-11, and SS-13 at concentrations ranging from 131 to 356 mg/kg. All of these metals, with the exception of iron in SS-3 and SS-11, fell within the observed range.

In addition to these metals, cyanide was detected in one sample, SS-11, at an estimated concentration of 3.5 mg/kg.

In summary, SS-3 contained seven metals at concentrations above the 90th percentile, and SS-11 contained five as well as cyanide. The remainder of the samples contained zero to three metals above the 90th percentile. The presence of cobalt in all of the surface samples at relatively similar concentrations suggests a natural local abundance of this metal. In terms of organic compounds, low concentrations of VOCs were detected in three samples. Additionally, phthalates and PAHs were detected at relatively low concentrations in numerous samples.

4.4.8 Leachate Samples

As discussed in Section 3.9, two leachate samples of liquid matrix were collected from the on-site leachate collection system. Sample L-1 was collected from Manhole 4 (MH-4), which is the next-to-last manhole before leachate from the northwest, northeast, and south-central fill areas enters the sump at Pump Station 1. Sample L-2 was collected from the sump at Pump Station 2, which contains leachate from the south fill area only. Both samples were analyzed for full TCL organic substances and inorganic substances according to NYSDEC CLP methods. Tables 4-18 and 4-19 summarize the organic and inorganic analytes detected in the leachate samples.

Leachate sample L-1, which consisted of a reddish-orange liquid of pH 7.02 and conductivity of 860 ppm, contained two VOCs: total 1,2-DCE at 8 µg/L and TCE at an estimated concentration of 2 µg/L. Sample L-2, a reddish-orange liquid of pH 6.63 and conductivity of 1,170 ppm, contained three VOCs: TCE at 14 µg/L, chlorobenzene at an estimated 3 µg/L, and total 1,2-DCE at an estimated concentration of 2 µg/L.

Sample L-1 contained no semivolatile substances, PCBs, or pesticides, while L-2 did not include any PCBs or pesticides. However, several semivolatile substances were detected in L-2 at estimated concentrations as follows: 4-chloro-3-methylphenol at 4 µg/L; 1,4-dichlorobenzene at 1 µg/L; di-n-butylphthalate at 2 µg/L; naphthalene at 1 µg/L; and n-nitrosodiphenylamine at 1 µg/L. Di-n-butylphthalate, a common laboratory and field contaminant, is included in this discussion because it was not detected in the laboratory method blank.

Since leachate on site has in the past flowed directly into the unnamed tributary to Duffy Creek and the potential still exists for this to occur, the leachate results were compared to NYSDEC Class C surface water standards in order to preliminarily assess the leachate's potential impact on the creek. The only organic substances found to exceed these standards and guidance values were TCE and 4-chloro-3-methylphenol in L-2.

Of the 24 inorganic analytes tested for, 17 were detected in the leachate samples, as detailed in Table 4-19. Arsenic, barium, beryllium, cadmium, chromium, copper, magnesium, manganese, nickel, potassium, and sodium were all detected in one or both leachate samples at concentrations below NYSDEC Class C standards. Aluminum, cobalt, iron, lead, and zinc were detected in concentrations above Class C standards in both samples. Vanadium exceeded the imposed standard in L-1 only.

In summary, the leachate from the south fill area contained more organic compounds than the leachate collected at MH-4. However, the concentration of VOCs in the leachate is much less than in the air above the leachate as discussed in Section 4.4.9. In terms of inorganic substances, several metals exceeded Class C standards; however, most appear ubiquitous at the site, with the exception of lead and vanadium.

4.4.9 Air Samples

As discussed in Section 3.10, the manholes and risers of the leachate collection system were surveyed with air monitoring equipment in order to locate "hot spots" and identify leachate and air sampling locations. Data were collected on September 30, 1991 prior to the leachate sampling. These data, along with data from the additional survey performed on December 17 and 18, 1991 prior to air sampling, are presented in Table 4-20. Since only two leachate samples could be collected (see Section 3.9), air samples were collected from the "hottest" manholes and risers from each fill area, as detailed on Table 3-6. Eight air samples were collected, including one field duplicate and one field blank. All samples were analyzed for VOCs by EPA method TO-14, which utilizes SUMMA® canisters. The analytical results provided by Air Toxics, Ltd. are provided in Appendix F.

As detailed in Table 4-21, several VOCs were detected in the air samples, including aromatic hydrocarbons (including benzene, ethylbenzene, 1,2,4-trimethylbenzene, toluene, and o-, m-, and p-xylene), chlorinated aliphatic hydrocarbons (including chloroethane; 1,1-DCA; cDCE; MC; 1,1,1-TCA; TCE; and VC), and chlorofluorocarbons (CFCs) (including Freon® 11 [fluorotrichloromethane], Freon® 12 [dichlorodifluoromethane], Freon® 113 [1,1,2-trichloro-1,2,2-trifluoroethane], and Freon® 114 [dichlorotetrafluorethane]).

Sample A-1 (MH-10) contained 22,100 parts per billion by volume (ppbv) of aromatic hydrocarbons and 71,000 ppbv of chlorinated aliphatic compounds, totaling 93,100 ppbv VOCs. Sample A-2 (R-10) contained 12,500 ppbv aromatics, more than 100,000 ppbv chlorinated aliphatics, and 2,910 ppb CFCs, totaling 116,000 ppbv VOCs. Sample A-3 (MH-6) contained 29,600 ppbv aromatics and approximately 102,000 ppbv chlorinated aliphatic compounds, totaling 131,000 ppbv VOCs. Sample A-4 (MH-15) contained approximately 10,300 ppbv aromatics; 2,370 ppbv chlorinated aliphatics; and 2,660 ppbv CFCs, totaling 15,400 ppbv VOCs. Sample A-5 (R-2) contained 234 ppbv aromatics, 106 ppbv chlorinated aliphatics, 19.8 ppbv CFCs, and 3.8 ppbv chlorinated aromatics, totaling 360 ppbv VOCs. Duplicate sample A-6 contained similar compounds to A-5 but at about half the concentration, totaling 170 ppbv VOCs. Sample A-7 contained 8,090 ppbv aromatics and 18,600 ppbv chlorinated aliphatics, totaling 26,700 ppbv VOCs. Sample A-8, the field blank through which purified nitrogen was run, contained 3.6 ppbv 1,2-dichlorobenzene and 2.8 ppbv Freon® 113, neither of which was detected in any other sample. In addition, A-8 was found to contain 1.6 ppbv of MC, which was also detected in A-2, but at a significantly high enough concentration that it is not considered background contamination.

In summary, the samples containing the highest concentrations of VOCs were those collected nearest the northwest fill area. Manhole 6, located at the southern end of the northwest fill area before the junction with the line from the northeast fill area, contained the highest concentration of VOCs. The air samples contained much higher concentrations of VOCs than the liquid leachate samples. This indicates that the collection system is efficiently removing VOCs from the leachate or it is serving as a direct migratory pathway for VOCs from the fill areas, or both.

4.4.10 Leachate Collection System Evaluation

As discussed in Section 3.11, information regarding the leachate collection system was collected during the RI by means of visual inspection, surveying, and file review. Since these data pertain to the FS, results are not discussed in the RI report.

4.5 DATA ASSESSMENT SUMMARY

All analytical data generated for this remedial investigation have been reviewed by a third-party data validator for compliance, completeness, and data usability. QA/QC concerns that may have an effect on data usability are summarized below with the appropriate data qualifiers.

- Low levels of MC, acetone, di-n-butylphthalate, and bis(2-ethylhexyl)phthalate were attributable to laboratory background contamination because they were present in the method blanks at comparable levels. In some instances, the method blanks did not exhibit contamination by one or more of these common contaminants. However, because MC and acetone are widely used laboratory solvents and phthalate esters are present in the gloves used in handling samples, their presence is most likely due to laboratory/field contamination. Di-n-butylphthalate in TP-4 and TP-5 and bis(2-ethylhexyl)phthalate in TP-1, TP-2, TP-4, and TP-5 are at levels higher than those usually found for laboratory or field contamination.

- Volatile analysis holding time of seven days was exceeded by one day for the following samples: SB-2A, SB-3A, SB-3B, SS-10D-RE, and SS-13-RE. The holding time was exceeded by three to four days for samples TP-1 to TP-5, TP-1DL, and TP-2 MS/MSD. Sample TP-1DL was analyzed according to medium level protocol, so no qualification was necessary. Positive results and quantitation limits for aromatic volatiles in these samples were qualified "J" and "UJ" as estimated. However, samples SB-2A, SB-3A, and SB-3B were re-collected and analyzed within the holding time.

- Surrogate recovery for bromofluorobenzene was below QC limits for volatile analysis of the following samples: GW-5D, TB-1, SS-1, SS-2-RE, SS-13, and SS-13-RE. Matrix interference was substantiated for SS-13 because reanalysis gave similar results. Surrogate recoveries for toluene-d8 and bromofluorobenzene were below QC limits for sample TP-1DL. Positive results and limits for all volatile substances in these samples were qualified "J" and "UJ" as estimated.

- Several samples indicated one or more high surrogate recoveries for volatile analysis, including TB-1-RE, SS-1-RE, SS-2, SS-7, SS-7-RE, SB-7A, SB-7B, SB-10B, GW-5S, GW-6S, GW-11S, GW-12D, GW-12D-RE, GW-13D, and GW-13S. Matrix interferences were substantiated for SS-7 and GW-12D because reanalysis gave similar results. Positive results only in these samples were qualified "J" as estimated.

- Positive results for 2-butanone in TP-1 and TP-5 were qualified "J" as estimated due to a relative standard deviation result of greater than 35% for the initial calibration of 2-butanone.

- Low internal standard (IS) areas for volatile analysis of several samples were noted. Samples SS-1, SS-2-RE, SS-7, SS-7-RE, SS-10D, and SS-13 gave low IS areas for chlorobenzene-d5, and sample SS-7 also gave a low IS area for bromochloromethane. Positive results and limits for the compounds quantitated using these ISs were qualified "J" and "UJ" as estimated in these samples.

- Base/neutral/acid extractable (BNA) extraction holding time of five days was exceeded by one day for samples SB-6A and SB-6B; by 23 days for samples GW-2D-RE, GW-8S, and GW-10S-RE; and by 28 days for sample GW-11-SDD-RE. Positive results and limits for BNAs in these samples were qualified "J" and "UJ" as estimated.

- Two or more acid phenol (AP) surrogates gave recoveries of less than 10% for BNA analysis in the following samples: GW-2D, GW-2D-RE, GW-10S, GW-10S-RE, GW-11-SDD, GW-13D, and GW-13D-RE. Reanalysis of GW-11-SDD gave one recovery below 10%. AP quantitation limits for GW-11SDD-RE were qualified "UJ" as estimated, while AP limits for the other samples were qualified "R" as rejected. Matrix interferences were substantiated by poor AP recoveries for the reanalysis of these samples.

- Low IS areas for BNA analysis of several samples were noted. The following samples had low IS areas for chrysene-d12 and perylene-d12: SS-12, SS-13, SS-14, and their reanalyses. In addition, samples SS-9 and SS-14 had low IS areas for perylene-d12 only. Four IS areas were low for sample TP-5: acenaphthene-d10, phenanthrene-d10, chrysene-d12, and perylene-d12. In most instances, matrix interferences were substantiated by similar results for reanalyses or MS/MSD analyses. Positive results and limits for the compounds quantitated using these ISs were qualified "J" and "UJ" as estimated in the associated samples.

- Pesticide/PCB extraction holding time of five days was exceeded by one day for samples SB-6A and SB-6B. Positive results and limits for pesticide/PCBs in these samples were qualified "J" and "UJ" as estimated.

- Several pesticides gave percent difference (%D) values greater than 20% for continuing calibration, including beta-BHC; dieldrin; 4,4'-DDE; 4,4'-DDD; and 4,4'-DDT. Positive results for these compounds in samples TP-1 and TP-2 were qualified "J" as estimated.

- Volatile analysis of residential well samples by Method 524.2 indicated zero percent recovery for 1,2-dibromo-3-chloropropane in both laboratory-fortified blank spikes. The quantitation limit for this compound was qualified "R" as rejected in all residential well samples.

- Cobalt results for SW-1 to SW-6 were qualified "U" as undetected because cobalt was detected at 6.1 μg/L in the associated preparation blank. Manganese results for SW-4, SW-4D, and SW-6 were qualified "U" because manganese was detected at 3.2 μg/L in the preparation blank. Manganese and zinc results for DW-1 were qualified "U" because of manganese detected at 2.6 μg/L and zinc at 4.9 μg/L in the preparation blank. The iron result for GW-7D was qualified "U" because of iron detected at 15.9 μg/L in the preparation blank.

- Field blank results for rinsate sample R-1 were used to qualify the associated soil samples. Cadmium results for SB-8AD, SB-8B, and SB-9B were qualified "U" as undetected because of cadmium detected at 6.5

µg/L in R-1. All other contaminants found in R-1 were either present at greater than five times the blank level or not detected in the associated samples.

- The cyanide holding time of 12 days was exceeded by six days for samples TP-1, TP-2, and TP-3. Quantitation limits for cyanide in these samples were qualified "UJ" as estimated.

- For samples TP-1 to TP-5, inorganic spike recoveries were zero percent for antimony and selenium; between 30% and 75% for arsenic, silver, thallium, and zinc; and greater than 125% for lead. Quantitation limits for antimony and selenium were qualified "R" as rejected; arsenic, lead, and zinc positive results were qualified "J" as estimated; and silver and thallium limits were qualified "UJ" as estimated.

- Inorganic spike recovery was less than 30% for antimony in four spike analyses. Quantitation limits for antimony were qualified "R" as rejected in the associated samples SB-1A to SB-6A, SB-1B to SB-6B, SB-5C, and SB-10A. Arsenic, selenium, and silver results and limits for these samples were qualified "J" and "UJ" as estimated, due to spike recoveries between 30% and 75%.

- For water samples L-1 (MH-4) and L-2 (PS#2), antimony and silver gave spike recoveries between 30% and 75%, while arsenic and selenium gave recoveries less than 30%. For soil samples SS-1 to SS-14, antimony and silver gave zero percent recoveries, while mercury and selenium gave recoveries between 30% and 75%. Antimony and silver quantitation limits were qualified "UJ" as estimated for the waters and "R" as rejected for the soils. Arsenic results were qualified "J" as estimated, while arsenic and selenium limits were qualified "R" as rejected for the waters. Mercury and selenium limits were qualified "UJ" as estimated for the soils.

- For soil samples SB-7A, SB-7B, and SED-1 to SED-6, antimony and silver gave spike recoveries less than 30%, and selenium gave a recovery between 30% and 75%. For water samples SW-1 to SW-6, selenium gave a recovery between 30% and 75%. Antimony and silver limits were qualified "R" as rejected for the soils, and selenium limits were qualified "UJ" as estimated for both soils and waters.

- Duplicate results gave relative percent difference (RPD) values greater than QC limits for the following: manganese for soil samples SB-1A to SB-6A, SB-1B to SB-6B, SB-5C, and SB-10A; lead for water samples L-1 (MH-4) and L-2 (PS#2); barium, manganese, and cyanide for soil samples SS-1 to SS-14; lead and iron for water samples SW-1 to SW-6; lead for water samples GW-1D to GW-4D, GW-2S, GW-3S, GW-8S to GW-10S, GW-9D, and GW-10D, and barium and zinc for soil samples TP-1 to TP-5. Positive results for these analytes in the associated samples were qualified "J" as estimated.

- Serial dilution results for water samples L-1 (MH-4) and L-2 (PS#2) gave %D values greater than 10% for aluminum and zinc. For soil samples SS-1 to SS-14, the %D for iron exceeded 10%. For water samples DW-1 to DW-7, GW-5D to GW-7D, GW-5S to GW-7S, GW-11S to GW-13S, GW-11-SDD, GW-12D, and GW-13D, the %D for aluminum exceeded

10%. Positive results for these analytes that exceeded 50 times the instrument detection limit (IDL) were qualified "J" as estimated in the associated samples.

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Table 4-1

MONITORING WELL AND WATER LEVEL ELEVATION DATA[a]

	Elevation (feet)		Water Surface Elevation	
Well ID	Ground	Top of Inner Casing	10/22/91 through 10/24/91	11/20/91
MW-1D	277.63	280.27	213.40	213.19
MW-2D	208.30	211.01	158.41	158.31
MW-2S	204.59	207.29	197.54	198.60
MW-3D	174.80	178.05	164.10	163.91
MW-3S	175.10	177.56	162.16	170.39
MW-4D	176.49	178.95	166.69	167.38
MW-5D	151.52	153.55	150.25	150.27
MW-5S	151.55	154.12	150.48	150.49
MW-6D	132.81	134.83	116.69	116.79
MW-6S	132.15	134.79	122.44	123.10
MW-7D	96.48	98.99	65.13	65.40
MW-8S	109.78	112.23	102.96	103.11
MW-9D	156.26	158.93	130.76	129.15
MW-9S	156.71	159.12	138.83	141.77
MW-10D	184.40	186.65	163.18	161.24
MW-10S	184.65	187.20	172.90	172.39
MW-11S	88.32	90.32	82.61	83.71
CW-3A	98.26	100.43	94.77	85.95
CW-3B	99.43	100.59	90.29	87.81
CW-4A	91.66	92.81	88.37	89.18
CW-4B	91.65	92.53	88.39	88.50

[a] Elevation reference: Site benchmark, BM-1 = 296.150 feet.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-2

ORGANIC COMPOUNDS DETECTED IN TRENCH SAMPLES
(all values reported in μg/kg)

Compound	TP-1	TP-2	TP-3	TP-4	TP-5
Volatiles					
Acetone	4,500 DJ	230 J	1,800 J	ND	370 J
Benzene	ND	ND	ND	ND	78 J
2-Butanone	490 J	ND	ND	ND	75 J
1,1-Dichloroethane	710	ND	ND	ND	ND
total 1,2-Dichloroethene	3,900 DJ	ND	2,200	2,900	21 J
Ethylbenzene	33,000 J	31 J	12,000 J	830 J	1,200 J
2-Hexanone	120	ND	ND	ND	44 J
Methylene chloride	U	U	U	U	110
4-Methyl-2-pentanone	260 J	ND	ND	ND	ND
Styrene	45	ND	ND	4,200	ND
Tetrachloroethene	ND	ND	ND	520 J	ND
Toluene	970 J	11 J	760 J	3,200 J	33 J
Trichloroethene	73	ND	ND	5,300	ND
Vinyl chloride	980 DJ	ND	ND	ND	ND
Total xylenes	1,700 J	51 J	ND	690 J	350 J
Semivolatiles					
Benzo(b)fluoranthene	ND	370 J	ND	ND	ND
Benzo(a)pyrene	ND	280 J	ND	ND	ND
Benzyl alcohol	ND	ND	ND	1,200 J	ND
Bis(2-ethylhexyl)phthalate	1,100 J	1,100 J	U	8,300	8,300 J
Butylbenzylphthalate	ND	16,000	ND	1,000 J	2,700 J
4-Chloro-3-methylphenol	ND	300 J	ND	ND	ND
Chrysene	ND	410 J	ND	ND	ND
Di-n-butylphthalate	ND	270 J	U	14,000	4,100 J
1,2-dichlorobenzene	ND	ND	ND	1,200 J	670 J
Diethylphthalate	110 J	ND	25 J	ND	ND
Dimethylphthalate	ND	ND	ND	910 J	530 J

Key at end of table.

Table 4-2

ORGANIC COMPOUNDS DETECTED IN TRENCH SAMPLES
(all values reported in µg/kg)

Compound	TP-1	TP-2	TP-3	TP-4	TP-5
Fluoranthene	280 J	720 J	ND	ND	300 J
2-Methylnaphthalene	ND	180 J	ND	ND	190 J
4-Methylphenol	1,600 J	820 J	870	ND	370 J
Naphthalene	ND	140 J	ND	ND	150 J
Pentachlorophenol	ND	ND	ND	ND	6,600 J
Phenanthrene	130 J	540 J	ND	ND	610 J
Pyrene	190 J	530 J	ND	ND	340 J
Pesticides					
beta-BHC	12 J	ND	ND	ND	ND
Dieldrin	ND	13 J	ND	ND	ND
4,4'-DDE	ND	15 J	ND	ND	ND
4,4'-DDD	ND	43 J	ND	ND	120
4,4'-DDT	ND	130 J	ND	ND	ND

Key:

D = Reported result is taken from diluted sample analysis.
J = Associated numerical value is considered estimated.
ND = Compound was not detected above the CRQL.
U = The compound was detected in the method blank at comparable level and is considered undetected.

Source: Ecology and Environment Engineering, P.C. 1991.

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Table 4-3

INORGANIC ANALYTES DETECTED IN TRENCH SAMPLES

(all values reported in mg/kg)

Analyte	TP-1	TP-2	TP-3	TP-4	TP-5	Common Range in Eastern U.S. Soils[a] Observed Range	Common Range in Eastern U.S. Soils[a] Upper Limit of 90th Percentile
Aluminum	13,200	9,450	13,900	12,000	14,600	7,000 - 100,000	128,000
Arsenic	20.9 J	14.3 J	12.2 J	11.5 J	12.7 J	<0.1 - 73	16.0
Barium	132 J	121 J	121 J	85.7 J	215 J	10 - 1,500	867
Beryllium	0.74 B	0.47 B	0.71 B	0.60 B	0.64 B	<1 - 7	1.81
Calcium	4,350	9,890	1,610	1,850	2,710	100 - 280,000	14,400
Chromium	28.8	18.2	23.2	24.3	26.9	1 - 1,000	112
Cobalt	28.1	20.8	24.9	26.0	24.5	<0.3 - 70	19.8
Copper	29.0	28.4	194	25.4	34.6	<1 - 700	48.7
Iron	36,400	23,900	31,700	35,100	38,300	100 - >100,000	54,100
Lead	33.4 J	53.5 J	15.3 J	86.9 J	62.5 J	<10 - 300	33.0
Magnesium	5,070	4,470	4,240	4,130	3,330	50 - 50,000	10,700
Manganese	760	422	661	784	709	<2 - 7,000	1,450
Nickel	43.2	25.8	33.5	35.0	31.9	<5 - 700	38.2
Potassium	2,160	1,970	2,230	1,570	1,670	50 - 37,000	23,500
Sodium	509 B	289 B	323 B	71.2 B	276 B	<500 - 50,000	17,400

Key [illegible] end of table.

Table 4-3

INORGANIC ANALYTES DETECTED IN TRENCH SAMPLES

(all values reported in mg/kg)

						Common Range in Eastern U.S. Soils[a]	
Analyte	TP-1	TP-2	TP-3	TP-4	TP-5	Observed Range	Upper Limit of 90th Percentile
Vanadium	17.8	15.1	22.0	18.6	26.2	<7 - 300	140
Zinc	173 J	258 J	269 J	87.4 J	263 J	<5 - 2,900	104

[a] Shacklette and Boerngen 1984.

Key:

B = Result is greater than IDL but less than CRDL.
J = Reported value is estimated due to variance from QC limits.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-4

ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported in μg/kg)

Compound	SB-1A[a] (12-14')	SB-1B[a] (1-2')	SB-2A (6.5-7.5')	SB-3A (1-2')	SB-3B (10-12')	SB-4A (2-4')	SB-4B (7-9')	SB-5B (8-9')	SB-5C (18-19')
Volatiles									
total 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	87	61
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	22	13
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	21	7 J
Semivolatiles									
None Detected			NA	NA	NA	NA	NA	NA	NA

Key at end of table.

Table 4-4

ORGANIC COMPOUNDS DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported in μg/kg)

Compound	SB-6A (6-10')	SB-6B (12-14')	SB-7A (8-10')	SB-7B (20-21' and 22-23')	SB-8A (7-9')	SB-8AD[b] (7-9')	SB-8B (21-23')	SB-9A (4-6')	SB-9B (26-27.5')	SB-10A (5-7')	SB-10b (18-19')
Volatiles											
total 1,2-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatiles											
None Detected								NA	NA	NA	NA

[a] Background samples from well MW-1D.
[b] Field duplicate of sample SB-8A.

Key:

J = The reported value is estimated.
NA = Not analyzed for.
ND = Not detected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-1A[a] (12-14')	SB-1B[a] (1-2')	SB-2A (6.5-7.5')	Common Range in Eastern U.S. Soils[c]	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	18,100	16,200	15,600	7,000 - 100,000	128,000
Arsenic	2.9 J	6.8 J	12.7 J	<0.1 - 73	16.0
Barium	31.2 B	72.3	109	10 - 1,500	867
Beryllium	0.64 B	0.50 B	1.1 B	<1 - 7	1.81
Cadmium	ND	ND	1.3	NA	NA
Calcium	1,180	1,050 B	850 B	100 - 280,000	14,400
Chromium	27.6	21.1	20.8	1 - 1,000	112
Cobalt	33.2	25.8	30.2	<0.3 - 70	19.8
Copper	37.0	7.7	29.3	<1 - 700	48.7
Iron	43,700	32,900	45,200	100 - >100,000	54,100
Lead	6.6 J	18.4 J	11.6 J	<10 - 300	33.0
Magnesium	6,680	3,650	6,710	50 - 50,000	10,700
Manganese	431 J	1,750 J	686 J	<2 - 7,000	1,450
Mercury	ND	ND	ND	0.01 - 3.4	0.265
Nickel	53.4	25.8	42.1	<5 - 700	38.2
Potassium	1,870	1,520	2,430	50 - 37,000	23,500
Sodium	54.6 B	34.2 B	99.5 B	<500 - 50,000	17,400
Vanadium	21.9	24.8	19.0	<7 - 300	140
Zinc	96.5 J	75.2 J	87.3 J	<5 - 2,900	104

Key at end of table.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-3A (1-2′)	SB-3B (10-12′)	SB-4A (2-4′)	Common Range in Eastern U.S. Soils^{c}	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	15,500	12,800	13,600	7,000 - 100,000	128,000
Arsenic	16.4 J	7.1 J	1.3 J	<0.1 - 73	16.0
Barium	71.3	137	281	10 - 1,500	867
Beryllium	0.69 B	0.59 B	0.63 B	<1 - 7	1.81
Cadmium	ND	ND	ND	NA	NA
Calcium	360 B	1,150	1,640	100 - 280,000	14,400
Chromium	18.6	18.2	22.2	1 - 1,000	112
Cobalt	29.2	22.5	30.1	<0.3 - 70	19.8
Copper	9.8	12.8	21.1	<1 - 700	48.7
Iron	35,100	30,600	32,500	100 - >100,000	54,100
Lead	32.8 J	20.1 J	ND	<10 - 300	33.0
Magnesium	3,590	4,570	5,820	50 - 50,000	10,700
Manganese	1,140 J	668 J	1,670 J	<2 - 7,000	1,450
Mercury	ND	ND	ND	0.01 - 3.4	0.265
Nickel	25.7	30.4	41.9	<5 - 700	38.2
Potassium	1,510	1,840	1,780	50 - 37,000	23,500
Sodium	35.5 B	71.7 B	ND	<500 - 50,000	17,400
Vanadium	21.4	16.9	18.9	<7 - 300	140
Zinc	56.9 J	65.7 J	74.6 J	<5 - 2,900	104

Key at end of table.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-4B (7-9')	SB-5B (8-9')	SB-5C (18-19')	Common Range in Eastern U.S. Soils^c	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	14,500	13,800	11,100	7,000 - 100,000	128,000
Arsenic	12.7 J	9.0 J	5.0 J	<0.1 - 73	16.0
Barium	42.8 B	132	80.7	10 - 1,500	867
Beryllium	0.86 B	0.77 B	0.49 B	<1 - 7	1.81
Cadmium	ND	ND	ND	NA	NA
Calcium	1,440	1,230	1,370	100 - 280,000	14,400
Chromium	21.1	20.1	15.4	1 - 1,000	112
Cobalt	32.7	25.6	21.3	<0.3 - 70	19.8
Copper	18.3	15.7	26.3	<1 - 700	48.7
Iron	41,400	33,700	26,000	100 - >100,000	54,100
Lead	8.0 J	13.0 J	12.7 J	<10 - 300	33.0
Magnesium	6,020	5,030	4,260	50 - 50,000	10,700
Manganese	1,010 J	694 J	551 J	<2 - 7,000	1,450
Mercury	ND	ND	ND	0.01 - 3.4	0.265
Nickel	48.0	36.4	30.1	<5 - 700	38.2
Potassium	1,990	1,710	1,110 B	50 - 37,000	23,500
Sodium	ND	ND	ND	<500 - 50,000	17,400
Vanadium	20.6	18.7	15.8	<7 - 300	140
Zinc	78.0 J	72.1 J	64.6 J	<5 - 2,900	104

Key at end of table.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-6A (6-10')	SB-6B (12-14')	SB-7A (8-10')	Common Range in Eastern U.S. Soils^c	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	13,500	13,100	13,000	7,000 - 100,000	128,000
Arsenic	10.6 J	15.7 J	11.7	<0.1 - 73	16.0
Barium	64.9	67.2	129	10 - 1,500	867
Beryllium	0.58 B	0.65 B	0.80 B	<1 - 7	1.81
Cadmium	ND	ND	ND	NA	NA
Calcium	742 B	777 B	1,600	100 - 280,000	14,400
Chromium	18.7	17.5	22.0	1 - 1,000	112
Cobalt	26.5	21.7	27.7	<0.3 - 70	19.8
Copper	15.5	12.5	23.6	<1 - 700	48.7
Iron	36,700	32,800	33,500	100 - >100,000	54,100
Lead	27.7 J	35.6 J	20.3 J	<10 - 300	33.0
Magnesium	4,660	4,720	5,130	50 - 50,000	10,700
Manganese	1,040 J	461 J	849	<2 - 7,000	1,450
Mercury	ND	ND	ND	0.01 - 3.4	0.265
Nickel	38.5	31.5	39.0	<5 - 700	38.2
Potassium	1,520	1,720	1,680	50 - 37,000	23,500
Sodium	54.3 B	67.0 B	44.4 B	<500 - 50,000	17,400
Vanadium	15.9	14.8	19.0	<7 - 300	140
Zinc	71.6 J	66.7 J	72.0	<5 - 2,900	104

Key at end of table.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-7B (20-21' and 22-23')	SB-8A (7-9')	SB-8AD[b] (7-9')	Common Range in Eastern U.S. Soils[c]	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	12,500	12,100	13,200	7,000 - 100,000	128,000
Arsenic	14.5	14.1	10.4	<0.1 - 73	16.0
Barium	43.0	111	111	10 - 1,500	867
Beryllium	0.94 B	0.51 B	0.61 B	<1 - 7	1.81
Cadmium	ND	ND	U	NA	NA
Calcium	1,420	1,180	1,320	100 - 280,000	14,400
Chromium	21.7	15.1	18.8	1 - 1,000	112
Cobalt	27.0	21.8	24.9	<0.3 - 70	19.8
Copper	16.7	17.3	16.9	<1 - 700	48.7
Iron	35,800	29,400	32,700	100 - >100,000	54,100
Lead	13.3 J	13.9	12.3	<10 - 300	33.0
Magnesium	4,600	4,130	4,890	50 - 50,000	10,700
Manganese	909	996	828	<2 - 7,000	1,450
Mercury	ND	ND	ND	0.01 - 3.4	0.265
Nickel	40.1	32.2	34.7	<5 - 700	38.2
Potassium	2,710	1,470	1,790	50 - 37,000	23,500
Sodium	54.1 B	52.4 B	56.6 B	<500 - 50,000	17,400
Vanadium	21.0	14.0	16.2	<7 - 300	140
Zinc	71.3	60.1	66.2	<5 - 2,900	104

Key at end of table.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-8B (21-23′)	SB-9A (4-6′)	SB-9B (26-27.5′)	Common Range in Eastern U.S. Soils^c	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	11,500	13,800	13,900	7,000 - 100,000	128,000
Arsenic	10.6	17.4	17.9	<0.1 - 73	16.0
Barium	90.2	122	87.7	10 - 1,500	867
Beryllium	0.59 B	0.65 B	0.92 B	<1 - 7	1.81
Cadmium	U	ND	U	NA	NA
Calcium	1,540	1,700	1,800	100 - 280,000	14,400
Chromium	14.8	18.9	15.1	1 - 1,000	112
Cobalt	23.2	25.4	30.1	<0.3 - 70	19.8
Copper	12.6	17.9	22.9	<1 - 700	48.7
Iron	33,900	33,300	35,100	100 - >100,000	54,100
Lead	11.8	22.4	8.0	<10 - 300	33.0
Magnesium	4,900	5,450	5,200	50 - 50,000	10,700
Manganese	1,420	771	894	<2 - 7,000	1,450
Mercury	0.12	ND	ND	0.01 - 3.4	0.265
Nickel	31.1	35.6	37.9	<5 - 700	38.2
Potassium	1,560	1,840	2,100	50 - 37,000	23,500
Sodium	61.6 B	64.2 B	80.1 B	<500 - 50,000	17,400
Vanadium	14.2	16.1	16.6	<7 - 300	140
Zinc	62.1	69.3	75.2	<5 - 2,900	104

Key at end of table.

Table 4-5

INORGANIC ANALYTES DETECTED IN SUBSURFACE SOIL SAMPLES FROM BORINGS

(all values reported mg/kg)

Analyte	SB-10A (5-7')	SB-10B (18-19')	Common Range in Eastern U.S. Soils[c]	
			Observed Range	Upper Limit of 90th Percentile
Aluminum	13,400	5,550	7,000 - 100,000	128,000
Arsenic	14.1 J	3.1	<0.1 - 73	16.0
Barium	182	40.5 B	10 - 1,500	867
Beryllium	0.67 B	ND	<1 - 7	1.81
Cadmium	1.8	ND	NA	NA
Calcium	1,150	77,500	100 - 280,000	14,400
Chromium	18.6	9.3	1 - 1,000	112
Cobalt	27.0	14.5	<0.3 - 70	19.8
Copper	15.1	9.5	<1 - 700	48.7
Iron	32,100	14,700	100 - >100,000	54,100
Lead	45.3 J	7.3	<10 - 300	33.0
Magnesium	4,250	17,100	50 - 50,000	10,700
Manganese	1,430 J	290	<2 - 7,000	1,450
Mercury	ND	ND	0.01 - 3.4	0.265
Nickel	31.7	16.9	<5 - 700	38.2
Potassium	1,340	630 B	50 - 37,000	23,500
Sodium	38.3 B	103	<500 - 50,000	17,400
Vanadium	19.1	11.0	<7 - 300	140
Zinc	64.8 J	56.3	<5 - 2,900	104

[a] Background samples from well MW-1D.
[b] Field duplicate of sample SB-8A.
[c] Shacklette and Boerngen 1984.

Key:

B = Result is greater than IDL, but less than CRDL.
J = Reported value is estimated due to variance from quality control limits.
NA = Not applicable.
ND = Not detected.
U = Analyte was detected in preparation blank at comparable level and is considered undetected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-6

ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

(all values reported in μg/L)

Compound	GW-1D	GW-2D	GW-2S	GW-3D	GW-3S	GW-4D	GW-5D	GW-5S	GW-6D	GW-6S	GW-7D	GW-8S	GW-9D
Volatiles													
Acetone	ND	ND	ND	ND	33	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	6 J	11 J	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	3 J	ND	ND	ND	ND	11 J	12 J	ND	ND	ND	ND	ND
total 1,2-Dichloroethene	ND	520 D	ND	ND	ND	ND	4,600 DE	5,600 DE	200 D	5 J	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	3 J	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND	9 J	8 J	ND	ND	ND	ND	ND
1,1,1-Trichlorethane	ND	1 J	ND	ND	ND	ND	ND	4 J	ND	ND	ND	ND	ND
Trichloroethene	ND	230 D	ND	2 J	ND	1 J	310 D	370 D	7	ND	ND	ND	ND
Vinyl chloride	ND	160 D	ND	ND	ND	ND	1,400 D	2,100 D	63	ND	ND	ND	ND
Semivolatiles													
None detected			NA										

Key at end of table.

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Table 4-6

ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES

(all values reported in μg/L)

Compound	GW-9S	GW-10D	GW-10S	GW-11S	GW-11SDD[a]	GW-12D[b]	GW-12S	GW-13D	GW-13S	NYSDEC Class GA Groundwater Standard
Volatiles										
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	50 G
Chloroethane	ND	ND	ND	8 J	ND	ND	ND	ND	ND	5
Chloroform	2 J	ND	ND	ND	ND	ND	ND	ND	ND	7
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
1,1-Dichloroethene	ND	ND	ND	9 J	9	ND	ND	ND	ND	5
total 1,2-Dichloroethene	ND	3 J	ND	390 D	390 D	9 J	3 J	4 J	ND	5
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Methylene chloride	ND	ND	ND	ND	ND	4 J	ND	ND	ND	5
Toluene	ND	ND	ND	ND	ND	ND	5	ND	2 J	5
1,1,1-Trichlorethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Trichloroethene	ND	3 J	ND	1,200 D	1,200 D	ND	38	ND	ND	5
Vinyl chloride	ND	ND	ND	110 J	110	45 J	ND	ND	ND	2

Key at end of table.

Table 4-6

ORGANIC COMPOUNDS DETECTED IN GROUNDWATER SAMPLES
(all values reported in μg/L)

Compound	GW-9S	GW-10D	GW-10S	GW-11S	GW-11SDD[a]	GW-12D[b]	GW-12S	GW-13D	GW-13S	NYSDEC Class GA Groundwater Standard
Semivolatiles										
None detected	NA						NA			

[a] Field duplicate of sample G11S.
[b] Reported results from reanalysis of sample GW-12D.

Key:

ND = Not detected.
G = General organic guidance value (NYSDEC 1990).
J = The reported value is estimated.
D = Reported result is taken from diluted sample analysis.
E = Reported value is estimated because it exceeds the calibration limit.
NA = Sample not analyzed for semi-volatiles due to insufficient volume.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-7

INORGANIC ANALYTES DETECTED IN GROUNDWATER SAMPLES
(all values reported in $\mu g/L$)

Analyte	GW-1D	GW-2D	GW-2S	GW-3D	GW-3S	GW-4D	GW-5D	GW-5S	GW-6D	GW-6S	GW-7D	GW-8S	GW-9D
Aluminum	364	742	42,700	252	3.040	393	3,140 J	531	131 B	8,990 J	29.5 B	217	3,650
Arsenic	2.9 B	9.1 B	17.6	ND	2.4 B	ND	3.5 B	2.5 B	ND	6.4 B	ND	ND	4.3 B
Barium	273	49.0 B	342	101 B	53.4 B	13.9 B	110 B	12.6 B	20.0 B	40.2 B	10.2 B	61.4 B	43.4 B
Beryllium	ND	ND	2.2 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	21,800	30,600	53,600	49,700	31,900	13,100	9,160	16,300	16,000	12,800	30,200	65,200	26,400
Chromium	11.8	ND	110	ND	ND	ND	49.6	ND	ND	14.2	ND	ND	ND
Cobalt	ND	8.1 B	102	ND	14.7 B	ND	ND	ND	ND	11.3 B	ND	11.5 B	13.4 B
Copper	ND	3.3 B	115	ND	7.7 B	ND	46.2	3.2 B	ND	15.3 B	ND	ND	9.7 B
Iron	972 J	1,910 J	110,000 J	524 J	6,270 J	634 J	2,460	650	316	15,700	U	542 J	8,290 J
Lead	ND	4.1 J	38.1 J	ND	6.0 J	ND	2.4 B	ND	ND	10.8	ND	11.0 J	5.7 J
Magnesium	8,600	15,800	50,500	21,400	19,100	12,100	5,400	12,300	11,000	12,200	21,700	56,000	13,100
Manganese	227	1,820	6,530	41.2	1,300	72.3	1,060	563	628	514	16.4	2,200	179
Nickel	ND	ND	155	ND	ND	ND	ND	ND	ND	22.3 B	ND	ND	ND
Potassium	2,090 B	14,900	17,500	18,800	5,960	1,990 B	8,800	1,750 B	1,230 B	5,020	2,520 B	4,940 B	18,300
Sodium	4,690 B	19,700	20,900	29,800	20,400	9,730	516,000	9,920	6,080	7,450	19,000	35,500	32,600
Vanadium	ND	7.3 B	67.1	6.4 B	10.2 B	7.0 B	ND	ND	ND	10.1 B	ND	8.7 B	12.7 B
Zinc	ND	16.0 B	230	ND	24.1	ND	154	63.5	6.7 B	64.3	12.4 B	7.1 B	62.4

Key at end of table.

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Table 4-7

INORGANIC ANALYTES DETECTED IN GROUNDWATER SAMPLES

(all values reported in μg/L)

Analyte	GW-9S	GW-10D	GW-10S	GW-11S	GW-11SDD[a]	GW-12D	GW-12S	GW-13D	GW-13S	NYSDEC Class GA Groundwater Standard
Aluminum	342	1,250	1,760	2,230 J	2,480 J	910 J	2,760 J	2,640 J	286	NA
Arsenic	ND	5.6 B	4.1 B	ND	ND	ND	3.1 B	3.5 B	ND	25
Barium	36.8 B	262	208	69.5 B	71.3 B	36.4 B	91.9 B	211	85.7 B	1,000
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	3 G
Calcium	67,900	25,300	15,700	43,800	44,000	71,300	31,000	47,500	54,600	NA
Chromium	ND	ND	ND	ND	10.0	11.0	22.2	ND	ND	50
Cobalt	9.0 B	9.5 B	10.5 B	ND	ND	ND	ND	ND	ND	NA
Copper	ND	8.0 B	ND	3.7 B	9.1 B	11.6 B	9.0 B	4.7 B	ND	200
Iron	1,630 J	3,270 J	4,620 J	4,280	4,440	736	5,780	5,130	414	300[b]
Lead	1.2 J	7.6 J	3.3 J	3.5	4.6	ND	125	3.6	ND	25
Magnesium	30,800	8,090	6,300	22,100	22,200	37,300	3,100 B	21,500	24,600	35,000 G
Manganese	1,490	387	4,110	2,030	2,040	24.6	123	2,370	2,770	300[b]
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Potassium	11,300	27,100	4,380 B	2,140 B	1,970 B	2,540 B	38,000	4,340 B	2,320 B	NA
Sodium	33,200	20,200	5,720	14,600	18,700	33,300	41,700	21,200	24,600	20,000
Vanadium	7.2 B	8.4 B	7.8 B	ND	ND	ND	27.9 B	ND	ND	NA
Zinc	5.7 B	27.2	11.0 B	26.4	39.8	41.0	83.4	54.6	5.6 B	300

Key at end of table.

[a] Field duplicate of sample G11S.

[b] Total concentration of iron and manganese shall not exceed 500 µg/L.

Key:

J = Reported value is estimated due to variance for quality control limits.
B = Result is greater than IDL, but less than CRDL.
NA = No applicable NYS SCG.
ND = Not detected.
G = Guidance value (NYSDEC 1990).
D = Reported result is taken from diluted sample analysis.
U = Analyte was detected in preparation blank at comparable level and is considered undetected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-8

GROUNDWATER SAMPLE PARAMETERS

Sample Number	Well Number	Organic Sample Portion[a]				Inorganic Portion[b]	
		Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date/Time	Turbidity[c] (NTU)	Date/Time
GW-1D	MW-1D	123	11.0	146	10-22-91/1740	14	10-23-91/0910
GW-2D	MW-2D	218	11.5	210	10-22-91/1525	38	10-23-91/0925
GW-2S[d]	MW-2S	416	11.0	>4,000	10-22-91/1728	>4,000	10-23-91/0929
GW-3D	MW-3D	315	13.0	600	10-22-91/1555	20	10-23-91/0855
GW-3S	MW-3S	248	13.5	2,800	10-22-91/1618	160/>1,000	10-23-91/0858
GW-4D	MW-4D	124	13.0	141	10-22-91/1613	18	10-23-91/0835
GW-5D	MW-5D	182	14.0	660	10-24-91/1100	18	10-25-91/0845
GW-5S	MW-5S	166	14.5	585	10-24-91/1110	19	10-25-91/0850
GW-6D	MW-6D	138	12.5	770	10-24-91/1120	7	10-25-91/0900
GW-6S	MW-6S	121	14.0	2,000	10-24-91/1125	440	10-25-91/0903
GW-7D	MW-7D	265	11.0	361	10-23-91/1625	17	10-24-91/1035
GW-8S	MW-8S	586	14.0	>4,000	10-22-91/1654	15/960	10-23-91/1010
GW-9D	MW-9D	222	11.5	190	10-22-91/1634	240	10-23-91/1000
GW-9S[d]	MW-9S	NA	NA	>4,000	10-22-91/1634	>4,000	10-23-91/1002
GW-10D	MW-10D	145	11.0	1,600	10-22-91/1715	110/200	10-23-91/0940
GW-10S	MW-10S	116	13.0	2,700	10-22-91/1710	140/540	10-23-91/0937
GW-11S	MW-11S	322	12.0	309	10-23-91/1625	125	10-24-91/1025
GW-12D	CW-3A	449	14.0	182	10-23-91/1640	31	10-24-91/1043
GW-12S[d]	CW-3B	NA	14.0	270	10-23-91/1640	173	10-24-91/1042

Table 4-8

GROUNDWATER SAMPLE PARAMETERS

Sample Number	Well Number	Organic Sample Portion[a]				Inorganic Portion[b]	
		Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date/Time	Turbidity[c] (NTU)	Date/Time
GW-13D	CW-4A	391	15.0	>4,000	10-23-91/1655	114	10-24-91/1055
GW-13S	CW-4B	386	14.0	1,600	10-23-91/1655	75	10-24-91/1053

[a] Organic portion refers to VOC, BNA, PCB, and pesticides analyses except where noted.

[b] Inorganic portion refers to metals and total cyanide except where noted.

[c] Where two turbidities are listed, the first is for the metals portion and the second is for the cyanide portion.

[d] Due to low well volume, water was collected for VOC and metals analyses only.

Key:

NA = Data not acquired.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-9

ORGANIC COMPOUNDS DETECTED IN RESIDENTIAL WELL AND SPRING SAMPLES

(all values reported in μg/L)

Compound	DW-1 Rosini	DW-2 Teller	DW-3 Kelly	DW-4 Bauer	DW-5 LaDue	DW-5D LaDue	DW-6 Miller	DW-7 Vacarro	NYSDOH MCL[a]	NYSDEC Class GA Groundwater Standard
Volatiles										
Trichloroethene	ND	ND	ND	ND	2.6	2.9	ND	ND	5	5
Semivolatiles	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

[a] Maximum contaminant level per 10 NYCRR 5-1.5.2.

Key:

ND = Not detected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-10

INORGANIC ANALYTES DETECTED IN RESIDENTIAL WELL AND SPRING SAMPLES

(all values reported in μg/L)

Analyte	DW-1 Rosini		DW-2 Teller		DW-3 Kelly		DW-4 Bauer		DW-5 LaDue	
Aluminum	107	B	25.6	B	741		200	B	645	
Barium	32.8	B	72.8	B	67.0	B	54.7	B	26.4	B
Calcium	40,100		37,400		21,300		33,300		44,900	
Chromium	ND		ND		11.1		ND		ND	
Copper	4.5	B	ND		29.8		3.6	B	7.3	B
Iron	534		U		693		730		535	
Lead	ND		1.8	B	ND		ND		ND	
Magnesium	13,300		13,400		6,070		12,100		19,600	
Manganese	510		148		17.7		150		54.6	
Mercury	ND		ND		ND		0.46		ND	
Potassium	1,450	B	1,240	B	1,150	B	1,400	B	1,810	B
Sodium	50,400		8,200		31,600		58,000		17,000	
Zinc	8.8	B	134		39.4		338		26.7	
Cyanide	ND		ND		ND		ND		ND	

Key at end of table.

Table 4-10

INORGANIC ANALYTES DETECTED IN RESIDENTIAL WELL AND SPRING SAMPLES

(all values reported in μg/L)

Analyte	DW-5D[a] LaDue	DW-6 Miller	DW-7 Vacarro	NYSDOH MCL[b]	NYSDEC Class GA Groundwater Standard
Aluminum	134 B	400	16.9 B	NA	NA
Barium	24.3 B	31.5 B	34.7 B	1,000 P	1,000
Calcium	44,800	13,400	21,800	NA	NA
Chromium	ND	ND	ND	50 P	50
Copper	ND	ND	33.8	1,000 S	200
Iron	193	1,300	107	300[c] S	300[c]
Lead	ND	ND	ND	50 P	25
Magnesium	19,600	8,160	8,230	NA	35,000 G
Manganese	41.1	166	76.9	300[c] S	300[c]
Mercury	ND	ND	ND	2 P	2
Potassium	1,680 B	1,100 B	1,450 B	NA	NA
Sodium	8,540	4,110 B	55,100	NA[d]	20,000
Zinc	7.9 B	9.7 B	5.3 B	5,000 S	300
Cyanide	ND	19.0	ND	NA	100

[a] Field duplicate of sample DW-5.

[b] Maximum contaminant level per 10 NYCRR 5-1.5.2.

[c] Total concentration of iron and manganese shall not exceed 500 μg/L.

[d] Water containing 20,000 μg/L should not be used for drinking by people on severely restricted sodium diets.
Water containing >270,000 μg/L should not be used for drinking by people on moderately restricted sodium diets.

Key:

B = Result is greater than IDL, but less than CRDL.
G = Guidance value (NYSDEC 1990).
NA = No applicable NYS SCG.
ND = Not detected.
P = NYSDOH Primary Contaminant.
S = NYSDOH Secondary Contaminant.
U = Analyte was detected on preparation blank at comparable level and is considered undetected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-11

RESIDENTIAL WELL AND SPRING SAMPLE PARAMETERS

Sample	Owner	Type	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)
DW-1	Rosini	150-foot well	329	14.0	4.2
DW-2	Teller	120-foot well	218	14.0	5.0
DW-3	Kelly	56-foot well	162	13.5	1.2
DW-4	Bauer	130-foot well	319	15.0	9.0
DW-5	LaDue	Spring	269	15.0	18
DW-6	Miller	Spring	126	15.5	8.0/51[a]
DW-7	Vacarro	Well	260	19.0	1.5

[a] First value pertains to VOA, metals, and cyanide portions, which were filled first. Second value pertains to BNA and PCB/Pesticide portions that caused disturbance in spring when sampled.

Source: Ecology and Environment Engineering, P.C., 1991.

Table 4-12

ORGANIC COMPOUNDS DETECTED IN SURFACE WATER SAMPLES
(all values reported in µg/L)

Compound	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	NYSDEC Class C Surface Water Standard
Volatiles								
None detected.								
Semivolatiles								
Di-n-butylphthalate	2 J	1 J	ND	2 J	ND	ND	1 J	NA
Di-n-octylphthalate	ND	2 J	ND	ND	ND	ND	ND	NA

Key:

J = The reported value is estimated.
NA = No applicable NYS SCG.
ND = Not detected.

Source: Ecology and Environment Engineering, P.C., 1991.

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Table 4-13

INORGANIC ANALYTES DETECTED IN SURFACE WATER SAMPLES
(all values reported in μg/L)

Analyte	SW-1	SW-2	SW-3	SW-4	SW-4D[a]	SW-5	SW-6	NYSDEC Class C Surface Water Standard
Aluminum	578	307	496	119 B	274	874	96.0 B	100
Barium	35.4 B	43.6 B	99.3 B	49.5 B	50.8 B	57.7 B	49.2 B	NA
Calcium	15,400	15,900	19,800	18,000	17,900	18,300	17,200	NA
Copper	ND	5.8 B	ND	ND	ND	ND	ND	7.75[b]
Iron	1,110 J	3,840 J	778 J	150 J	387 J	1,610 J	130 J	300
Lead	2.2 J	1.7 J	4.8 J	4.9 J	2.5 J	2.7 J	1.1 J	1.48 - 1.90[c]
Magnesium	4,490 B	7,200	7,010	6,600	6,600	6,800	6,360	NA
Manganese	533	3,090	143	U	U	68.5	U	NA
Nickel	ND	30.6 B	ND	ND	ND	ND	ND	65.6[d]
Potassium	2,980 B	1,770 B	1,480 B	1,430 B	1,490 B	1,790 B	1,250 B	NA
Sodium	4,170 B	22,100	8,980	14,800	14,700	15,000	13,800	NA
Vanadium	6.5 B	6.3 B	6.1 B	ND	5.5 B	5.8 B	7.3 B	14
Zinc	8.5 B	19.4 B	10.7 B	4.1 B	7.3 B	6.8 B	ND	30

Key at end of table.

Table 4-13

INORGANIC ANALYTES DETECTED IN SURFACE WATER SAMPLES

(all values reported in μg/L)

Analyte	SW-1	SW-2	SW-3	SW-4	SW-4D[a]	SW-5	SW-6	NYSDEC Class C Surface Water Standard
Hardness (mg/L)	54	61	62	62	61	66	65	NA

[a] Duplicate sample of SW-4.

[b] Standard is a function of hardness. For SW-2 only, standard is 7.75 μg/L.

[c] Standard is a function of hardness as follows: SW-1 (1.48 μg/L); SW-2 (1.72); SW-3 (1.75); SW-4 (1.75); SW-4D (1.72); SW-5 (1.90); and SW-6 (1.87 μg/L).

[d] Standard is a function of harndess. For SW-2 only, standard is 65.6 μg/L.

Key:

B = Result is greater than IDL, but less than CRDL.
J = Reported value is estimated due to variance from quality control limits.
NA = No applicable NYS SCG.
ND = Not detected.
U = Analyte was detected in preparation blank at comparable level and is considered undetected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-14

ORGANIC COMPOUNDS DETECTED IN SEDIMENT SAMPLES

(all values reported in µg/kg except as noted)

Compound	SED-1	SED-2	SED-3	SED-4	SED-4D[a]	SED-5	SED-6	Sediment Criteria[b]	Limit of Tolerance[c]
Volatiles									
Acetone	20	30	10 J	31	38	11 J	ND	NA	NA
Semivolatiles									
Butylbenzylphthalate	ND	ND	24 J	ND	ND	ND	ND	NA	NA
Organic matter (%)	7.3	6.6	3.4	5.3	5.2	3.2	3.2		

[a] Field duplicate of sample SED-4.

[b] Geometric mean of "no-effect" and "lowest-effect" levels based on toxicity studies in benthic organisms (NYSDEC 1989).

[c] Concentration which would be detrimental to the majority of species (NYSDEC 1989).

Key:

J = The reported value is estimated.
NA = No applicable NYS SCG.
ND = Not detected.

Source: Ecology and Environment Engineering, P.C. 1991.

Page 1 of 2

Table 4-15

INORGANIC ANALYTES DETECTED IN SEDIMENT SAMPLES

(all values reported in mg/kg)

Analyte	SED-1	SED-2	SED-3	SED-4	SED-4D[a]	SED-5	SED-6	Sediment Criteria[b]	Limit of Tolerance[c]
Aluminum	12,800	13,000	12,400	14,500	16,900	11,200	11,000	NA	NA
Arsenic	12.7	10.9	11.0	9.6	14.3	8.1	13.5	5	33
Barium	123	97.4	175	169	202	192	129	NA	NA
Beryllium	0.81 B	0.96 B	0.89 B	0.91 B	1.1 B	0.85 B	0.85 B	NA	NA
Calcium	2,010	1,320 B	1,290	1,470 B	1,760 B	1,150 B	999 B	NA	NA
Chromium	22.5	21.3	18.5	20.9	24.4	18.5	18.3	26	111
Cobalt	26.9	27.8	26.1	24.8	29.7	27.9	25.4	NA	NA
Copper	20.5	16.0	16.0	19.8	23.0	16.7	15.7	19	114
Iron	32,400	43,200	36,000	31,600	38,400	39,000	40,200	24,000	40,000
Lead	26.1 J	20.8 J	20.7 J	20.2 J	26.7 J	3.2 J	18.9 J	27	250
Magnesium	3,900	3,630	3,720	4,270	5,010	3,660	3,510	NA	NA
Manganese	1,180	2,440	1,200	705	891	1,480	808	428	1,110
Nickel	40.1	33.4	37.7	36.2	42.2	38.1	36.0	22	90
Potassium	1,200 B	1,310 B	1,230 B	1,790 B	2,140 B	1,110 B	1,060 B	NA	NA
Sodium	ND	108 B	ND	ND	ND	ND	ND	NA	NA

Key at end of table.

Table 4-15

INORGANIC ANALYTES DETECTED IN SEDIMENT SAMPLES

(all values reported in mg/kg)

Analyte	SED-1	SED-2	SED-3	SED-4	SED-4D[a]	SED-5	SED-6	Sediment Criteria[b]	Limit of Tolerance[c]
Vanadium	22.8	22.1	19.7	21.4	25.3	17.5	18.2	NA	NA
Zinc	84.7	96.3	107	81.0	96.9	78.7	76.1	85	800

[a] Field duplicate of sample SED-4.
[b] Geometric mean of "no-effect" and "lowest-effect" levels based on toxicity studies in benthic organisms (NYSDEC 1989).
[c] Concentration which would be detrimental to the majority of species (NYSDEC 1989).

Key:

B = Result is greater than IDL, but less than CRDL.
J = Reported value is estimated due to variance from quality control limits
NA = No applicable NYS SCG.
ND = Not detected.

Source: Ecology and Environment Engineering, P.C. 1991.

Key at end of table.

Table 4-16

ORGANIC COMPOUNDS DETECTED IN SURFACE SOIL SAMPLES

(all values reported in μg/kg)

Compound	Background SS-1	Background SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	Background PAH Concentrations in Rural soils[b]
Volatiles									
Acetone	U	U	U	U	ND	U	U	U	
Chloromethane	ND	ND	ND	ND	ND	ND	40 J	ND	
Ethylbenzene	ND	ND	ND	ND	ND	1 J	18 J	ND	
Semivolatiles									
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	NA
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	20 - 30
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	ND	ND	10 - 110
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND	ND	ND	10 -70
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	2 - 1,300
Bis(2-ethylhexyl)phthalate	U	U	2,100	U	U	U	U	U	NA
Butylbenzylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	NA
Chrysene	ND	ND	ND	ND	ND	ND	ND	ND	38
Dibenz(a,h)anthracene	ND	ND	ND	ND	ND	ND	ND	ND	NA
Fluoranthene	ND	ND	ND	ND	ND	ND	55 J	ND	0.3 - 40
Ideno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND	ND	ND	10 - 15
Phenanthrene	ND	ND	ND	ND	ND	ND	46 J	ND	30
Pyrene	ND	ND	53 J	ND	ND	ND	59 J	ND	1 - 19.7

Key at end of table.

Table 4-16

ORGANIC COMPOUNDS DETECTED IN SURFACE SOIL SAMPLES

(all values reported in μg/kg)

Compound	SS-9	SS-10	SS-10D	SS-11	SS-12[a]	SS-13[a]	SS-14	Background PAH Concentrations in Rural soils[b]
Volatiles								
Acetone	ND	U	ND	240	ND	ND	U	
Chloromethane	ND	ND	ND	ND	ND	ND	ND	
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	
Semivolatiles								
Anthracene	ND	27 J	ND	ND	ND	ND	ND	NA
Benzo(b)fluoranthene	ND	67 J	ND	ND	ND	ND	140 J	20 - 30
Benzo(k)fluoranthene	ND	44 J	ND	ND	ND	ND	ND	10 - 110
Benzo(g,h,i)perylene	ND	ND	ND	ND	47 J	ND	ND	10 -70
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	88 J	2 - 1,300
Bis(2-ethylhexyl)phthalate	U	U	U	U	U	U	U	NA
Butylbenzylphthalate	ND	ND	50 J	ND	ND	260 J	ND	NA
Chrysene	40 J	100 J	ND	ND	ND	ND	48 J	38
Dibenz(a,h)anthracene	ND	ND	ND	ND	44 J	ND	ND	NA
Fluoranthene	ND	370 J	ND	ND	ND	ND	42 J	0.3 - 40
Ideno(1,2,3-cd)pyrene	ND	ND	ND	ND	45 J	ND	ND	10 - 15
Phenanthrene	ND	94 J	ND	ND	ND	ND	41 J	30
Pyrene	ND	280 J	ND	ND	ND	ND	49 J	1 - 19.7

Key at end of table.

Table 4-16 (Cont.)

[a] Indicates results from reanalyzed sample.
[b] ATSDR 1989

Key:

J = The reported value is estimated.
NA = No applicable data provided.
ND = Not detected.
U = Compound was detected in method blank at comparable level and is considered undetected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-17

INORGANIC ANALYTES DETECTED IN SURFACE SOIL SAMPLES

(all values reported in mg/kg)

Analyte	Background		SS-3	SS-4	SS-5	SS-6	Common Range in Eastern U.S. Soils^b	
	SS-1	SS-2					Observed Range	Upper Limit of 90th Percentile
Aluminum	13,100	10,400	1,030	12,300	10,300	14,300	7,000 - 100,000	128,000
Arsenic	10.3	13.5	7.3	10.0	11.9	12.6	<0.1 - 73	16.0
Barium	97.3 J	90.8 J	741 J	43.9 J	99.8 J	96.5 J	10 - 1,500	867
Beryllium	0.61 B	0.47 B	ND	0.49 B	0.52 B	0.70 B	<1 - 7	1.81
Calcium	3,390	915 B	173,000	176 B	1,070 B	925 B	100 - 280,000	14,400
Chromium	17.3	12.9	23.3	19.6	16.3	23.6	1 - 1,000	112
Cobalt	22.4	17.7	53.0	20.9	23.4	29.1	<0.3 - 70	19.8
Copper	11.3	6.6	1.5 B	18.4	17.8	28.2	<1 - 700	48.7
Iron	27,400 J	24,900 J	182,000 J	30,300 J	26,700 J	42,500 J	100 - >100,000	54,100
Lead	17.5	17.3	35.5	15.1	15.1	13.2	<10 - 300	33.0
Magnesium	2,440	1,710	2,950	3,840	3,860	5,290	50 - 50,000	10,700
Manganese	1,260 J	1,170 J	4,540 J	418 J	987 J	446 J	<2 - 7,000	1,450
Nickel	21.0	15.8	40.0	28.8	33.6	43.3	<5 - 700	38.2
Potassium	1,130 B	853 B	1,230 B	1,300	1,240 B	1,950	50 - 37,000	23,500
Sodium	90.9 B	74.8 B	1,610 B	49.1 B	40.1 B	78.8 B	<500 - 50,000	17,400
Vanadium	22.3	21.7	12.6 B	19.0	14.4	19.4	<7 - 300	140
Zinc	58.2	43.0	356	51.4	92.0	74.5	<5 - 2,900	104
Cyanide	ND	ND	ND	ND	ND	ND	NA	NA

Key at end of table.

Table 4-17

INORGANIC ANALYTES DETECTED IN SURFACE SOIL SAMPLES

(all values reported in mg/kg)

Analyte	SS-7	SS-8	SS-9	SS-10	SS-10D^a	SS-11	Common Range in Eastern U.S. Soils^b	
							Observed Range	Upper Limit of 90th Percentile
Aluminum	14,300	11,100	9,740	10,600	11,000	7,340	7,000 - 100,000	128,000
Arsenic	10.5	11.8	11.8	9.6	9.7	6.4	<0.1 - 73	16.0
Barium	135 J	105 J	84.8 J	151 J	147 J	309 J	10 - 1,500	867
Beryllium	0.71 B	0.57 B	0.49 B	0.60 B	0.56 B	ND	<1 - 7	1.81
Calcium	1,200 B	2,360	31,300	4,550	3,120	5,460	100 - 280,000	14,400
Chromium	24.0	19.3	15.9	19.8	20.0	40.4	1 - 1,000	112
Cobalt	27.5	27.1	21.1	31.6	30.1	87.3	<0.3 - 70	19.8
Copper	26.5	19.6	19.1	18.0	18.0	14.7	<1 - 700	48.7
Iron	40,200 J	45,600 J	26,300 J	60,300 J	54,300 J	283,000 J	100 - >100,000	54,100
Lead	23.8	14.5	15.6	15.8	22.4	56.1	<10 - 300	33.0
Magnesium	5,040	3,510	9,060	4,320	3,720	2,790	50 - 50,000	10,700
Manganese	374 J	548 J	1,000 J	922 J	880 J	798 J	<2 - 7,000	1,450
Nickel	39.4	32.2	26.9	34.3	33.0	88.0	<5 - 700	38.2
Potassium	1,930	1,870	1,400	1,570	1,750	2,250	50 - 37,000	23,500
Sodium	85.9 B	134 B	95.3 B	76.3 B	71.0 B	ND	<500 - 50,000	17,400
Vanadium	21.7	19.4	17.7	18.9	19.9	21.0 B	<7 - 300	140
Zinc	77.4	61.6	102	98.1	95.2	193	<5 - 2,900	104
Cyanide	ND	ND	ND	ND	ND	3.5 J	NA	NA

Key at end of table.

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Table 4-17

INORGANIC ANALYTES DETECTED IN SURFACE SOIL SAMPLES

(all values reported in mg/kg)

Analyte	SS-12	SS-13	SS-14	Common Range in Eastern U.S. Soils[b]	
				Observed Range	Upper Limit of 90th Percentile
Aluminum	13,100	11,500	10,500	7,000 - 100,000	128,000
Arsenic	12.3	13.4	4.0	<0.1 - 73	16.0
Barium	87.4 J	107 J	90.8 J	10 - 1,500	867
Beryllium	0.70 B	0.71 B	0.56 B	<1 - 7	1.81
Calcium	1,680	3,110	650 B	100 - 280,000	14,400
Chromium	18.8	20.3	17.0	1 - 1,000	112
Cobalt	26.3	31.6	22.8	<0.3 - 70	19.8
Copper	12.8	17.3	11.7	<1 - 700	48.7
Iron	29,800 J	46,400 J	23,800 J	100 - >100,000	54,100
Lead	17.9	23.0	16.4	<10 - 300	33.0
Magnesium	3,120	3,700	2,920	50 - 50,000	10,700
Manganese	1,190 J	1,940 J	235 J	<2 - 7,000	1,450
Nickel	25.3	32.6	24.2	<5 - 700	38.2
Potassium	1,670	1,670	1,510	50 - 37,000	23,500
Sodium	ND	94.8 B	ND	<500 - 50,000	17,400
Vanadium	25.6	22.7	20.7	<7 - 300	140
Zinc	59.3	131	72.3	<5 - 2,900	104
Cyanide	ND	ND	ND	NA	NA

Key at end o[illegible]ble.

Table 4-17 (Cont.)

[a] Field duplicate of sample SS-10.
[b] Shacklette and Boerngen 1984.

Key:

B =Result is greater than IDL, but less than CRDL.
J =Reported value is estimated due to variance from quality control limits.
NA =No applicable values given.
ND =Not detected.

Table 4-18

ORGANIC COMPOUNDS DETECTED IN LEACHATE SAMPLES
(all values reported in μg/L)

Compound	L-1 (MH-4)	L-2 (PS#2)	NYSDEC Class C Surface Water Standard
Volatiles			
Chlorobenzene	ND	3 J	5
total 1,2-dichloroethene	8	2 J	NA
Trichloroethene	2 J	14	11 G
Semivolatiles			
4-chloro-3-methylphenol	ND	4 J	1[a]
1,4-Dichlorobenzene	ND	1 J	5[b]
Di-n-butylphthalate	ND	2 J	NA
Naphthalene	ND	1 J	NA
N-Nitrosodiphenylanine	ND	1 J	NA

[a] Applies to total of chlorinated phenols.
[b] Applies to sum of meta, ortho, and para isomers.

Key:

G = Guidance value (NYSDEC 1990).
J = Reported value is estimated.
NA = No applicable NYS SCG.
ND = Not detected.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-19

INORGANIC ANALYTES DETECTED IN LEACHATE SAMPLES

(all values reported in μg/L)

Analyte	L-1 (MH-4)	L-2 (PS#2)	NYSDEC Class C Surface Water Standard
Aluminum	27,600 J	774 J	100
Arsenic	12.5 J	R	190
Barium	406	577	NA
Beryllium	0.96 B	ND	1,100
Calcium	191,000	123,000	NA
Chromium	39.9	15.2	962 / 791[a]
Cobalt	58.4	55.4	5
Copper	35.2	8.0 B	58.8 / 47.9[a]
Iron	71,900	165,000	300
Lead	47.9 J	27.2 J	34.6 / 25.6[a]
Magnesium	42,800	50,300	NA
Manganese	3,670	1,880	NA
Nickel	54.5	38.8 B	398 / 332[a]
Potassium	50,700	33,400	NA
Sodium	33,600	71,500	NA
Vanadium	52.2	11.6 B	14
Zinc	151 J	227 J	30
Hardness (mg/L $CaCO_3$)[b]	653	514	NA

[a] Standard is a function of hardness. First value is for L-1, second is for L-2.

[b] Hardness is calculated from reported concentrations of Ca^{2+} and Mg^{2+} (Freeze and Cherry 1979).

Key:

J = Reported value is estimated due to variance from quality control limits.
R = Reported value is unusable due to variance from quality control limits.
B = Result is greater than IDL, but less than CRDL.
ND = Not detected.
NA = No applicable NYS SCG.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-20

RESULTS OF LEACHATE COLLECTION SYSTEM AIR MONITORING SURVEY

Manhole/Riser	9-30-91			12-17/18-91
	HNu (ppm)	OVA (ppm)	Draeger Tube[a] (ppm)	HNu (ppm)
MH-1	0	>1,000	0	0
MH-2	NA	NA	NA	NA
MH-3	3	>1,000	3	6 - 8
MH-4	1.2	120	0	0
MH-5	0	>1,000	0	25
MH-6	<1	>1,000	0	92
MH-7	<1	>1,000	0	73
MH-8	NA	NA	NA	NA
MH-9	NA	NA	NA	NA
MH-10	<1	>1,000	0	40
MH-11	<1	>1,000	0	1.5
MH-12	0	250	0	0
MH-13	0	>1,000	0	0
MH-14	0	>1,000	0	0
MH-15	<1	>1,000	0	0
MH-16	<1	>1,000	0	0
MH-17	<1	>1,000	0	0
MH-18	NA	NA	NA	0
MH-19	NA	NA	NA	0
R-1	3	0[b]	0	6
R-2	7	>1,000	0	18 - 22
R-3	0	100	0	NA
R-4	0	30	0	15
R-5	0	250	0	0
R-6	0	>1,000	0	0
R-7	0	350	0	20
R-8	0	>1,000	0	0
R-9	0	20	0	2

Table 4-20

RESULTS OF LEACHATE COLLECTION SYSTEM AIR MONITORING SURVEY

Manhole/Riser	9-30-91			12-17/18-91
	HNu (ppm)	OVA (ppm)	Draeger Tube[a] (ppm)	HNu (ppm)
R-10	<1	400	0	125
R-11	<1	>1,000	0	100
R-12	<1	150	0	5
R-13	<1	10	0	6
R-14	<1	35	0	0
R-15	0	>1,000	0	0
R-16	11	>1,000	11	0
R-17	0	>1,000	0	0
R-18	0	>1,000	0	0
R-19	0	3	0	4 - 5
R-20	0	0	0	NA
R-21	0	>1,000	0	0
R-22	0	>1,000	0	0
R-23	0	>1,000	0	NA
Pump Station 2	34	>1,000	0	0
Pump Station 1				
Sump	0	300	0	NA
Tank No. 1	<1	180	0	NA
Tank No. 2	<1	100	0	NA

[a] Draeger tube for vinyl chloride (numerous chlorinated alkenes interfere and are also detected).

[b] Questionable data due to instrument malfunction.

Key:

NA = Data not acquired due to equipment malfunction or manhole not located.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 4-21

VOLATILE ORGANIC COMPOUNDS DETECTED IN AIR SAMPLES COLLECTED 12-19-91

Compound	Amount Detected (ppbv)							
	A-1	A-2	A-3	A-4	A-5	A-6[a]	A-7	A-8[b]
Benzene	ND	240	ND	ND	150	76	ND	ND
Chloroethane	ND	ND	ND	820	74	46	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	3.6
1,1-Dichloroethane	1,700	1,400	ND	55	6.9	ND	ND	ND
cis-1,2-Dichloroethene	55,000	87,000 E	100,000	190	4.6	ND	16,000	ND
Ethylbenzene	15,000	7,700	21,000	7,900 E	26	11	5,600	ND
Freon®11	ND	210	ND	180	ND	ND	ND	ND
Freon®12	ND	2,700	ND	1,500	16	7.2	ND	ND
Freon®113	ND	ND	ND	ND	ND	ND	ND	2.8
Freon®114	ND	ND	ND	980	3.8	ND	ND	ND
Methylene chloride	ND	860	ND	ND	ND	ND	ND	1.6
1,2,4-Trichlorobenzene	ND	ND	ND	ND	3.8	ND	ND	ND
1,1,1-Trichloroethane	2,300	800	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	390	ND	ND	4.4	ND	ND	ND
1,2-4-Trimethylbenzene	ND	ND	ND	34	ND	ND	ND	ND
Toluene	5,300	4,200	8,600	520	5.7	ND	1,500	ND
Vinyl chloride	12,000	9,700	1,700	1,300	16	6.6	2,600	ND
m,p-Xylene	1,800	370	ND	1,600	46	21	990	ND
o-Xylene	ND	ND	ND	290	6.4	3.2	ND	ND

Table 4-21

VOLATILE ORGANIC COMPOUNDS DETECTED IN AIR SAMPLES COLLECTED 12-19-91

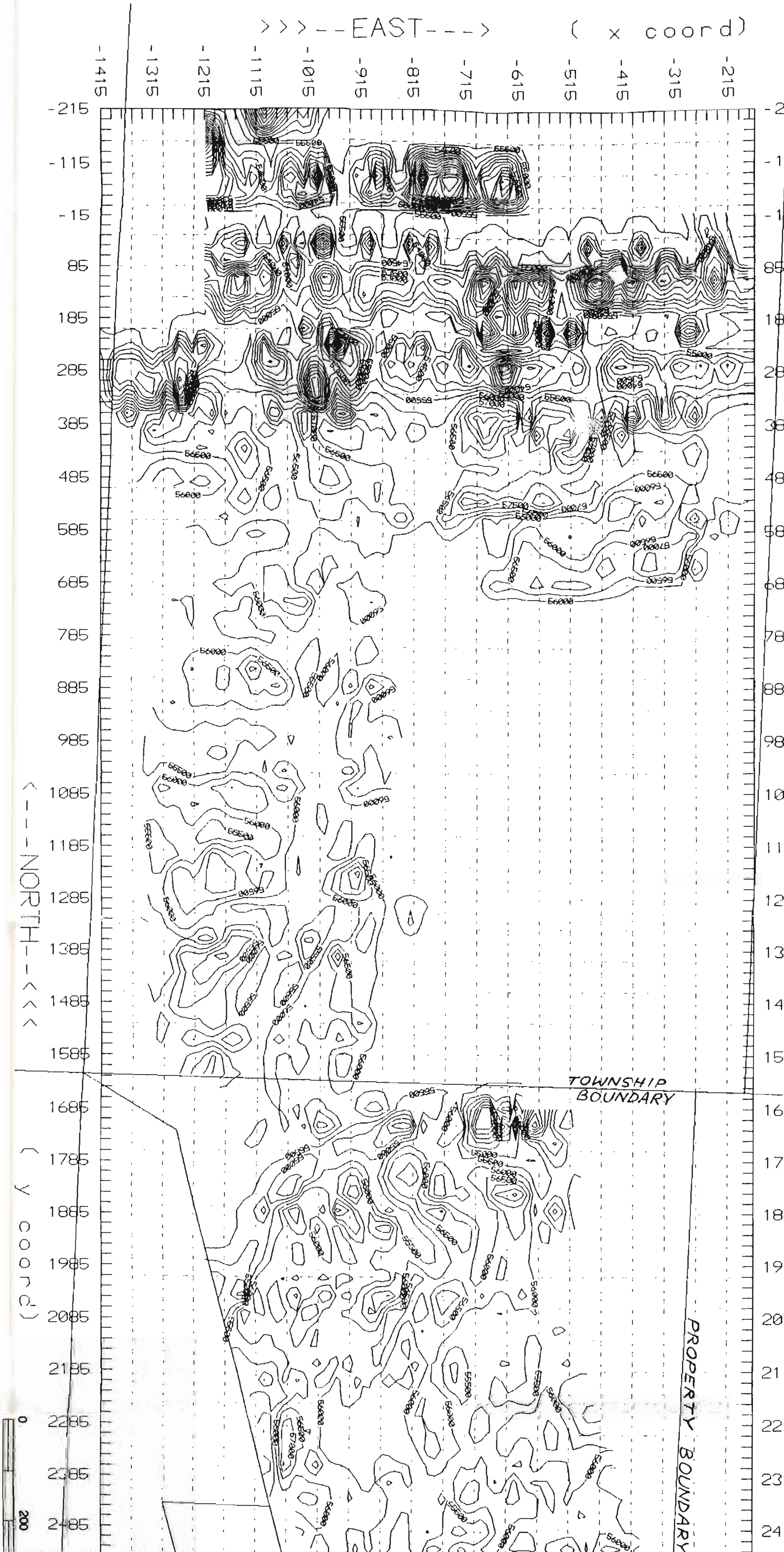
Compound	Amount Detected (ppbv)							
	A-1	A-2	A-3	A-4	A-5	A-6[a]	A-7	A-8[b]
MDL (ppbv)[c]	1,400	210	3,700	28	3.7	3.0	310	1.0
Manhole or riser no.	MH-10	R-10	MH-6	MH-15	R-2	R-2	MH-3	Blank

[a] Field duplicate of sample A-5.
[b] Blank consisting of purified nitrogen.
[c] Minimal detection limit (parts per billion by volume).

Key:

E = Exceeds instrument calibration range, but within linear range.
ND = Not detected.

Source: Air Toxics Ltd. 1992.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(y coord)
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-15
85
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285
385
485
585
685
785
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1285
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1685
1785
1885
1985
2085
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TOWNSHIP BOUNDARY
PROPERTY BOUNDARY
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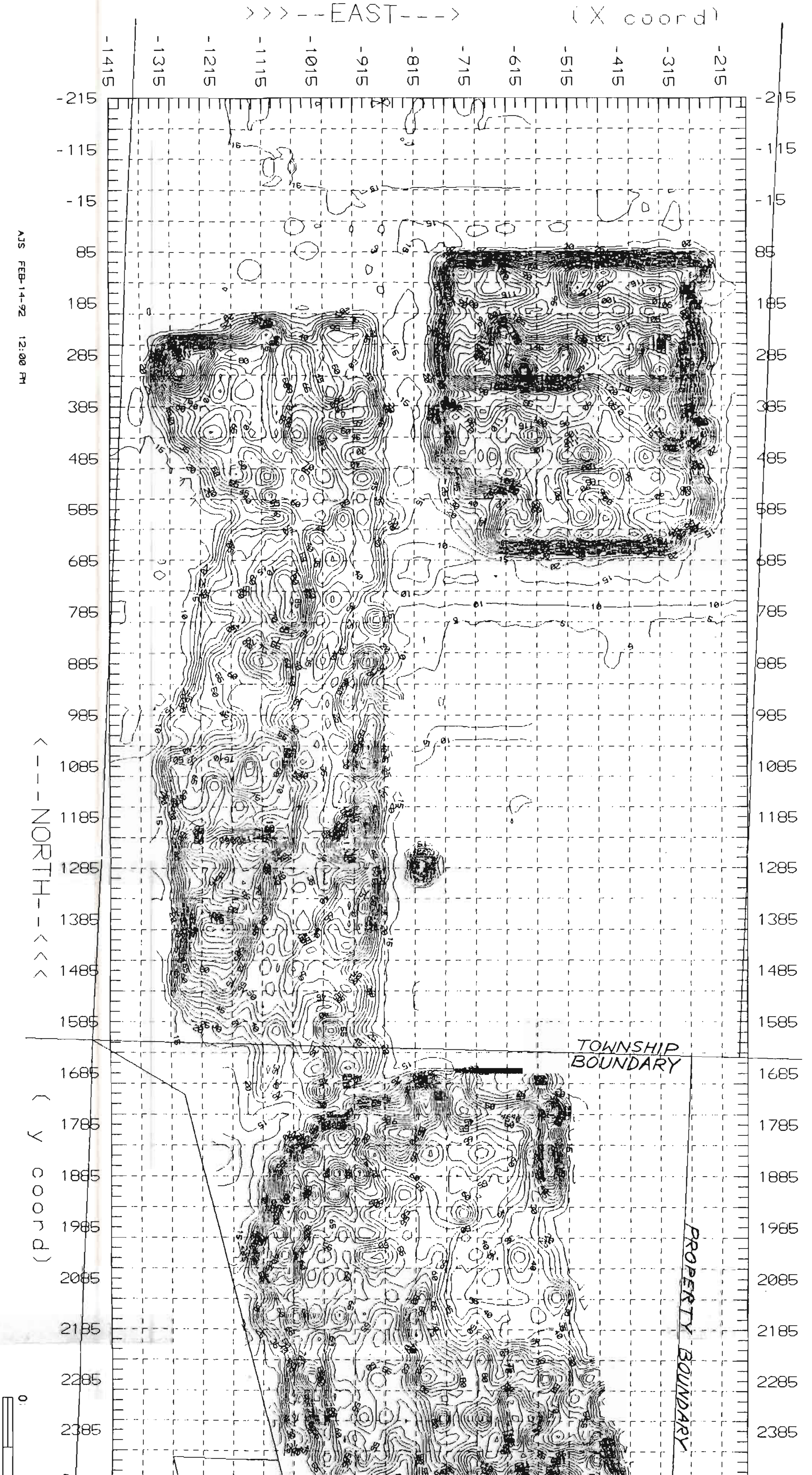
56500
57000

MAG
WELLS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785
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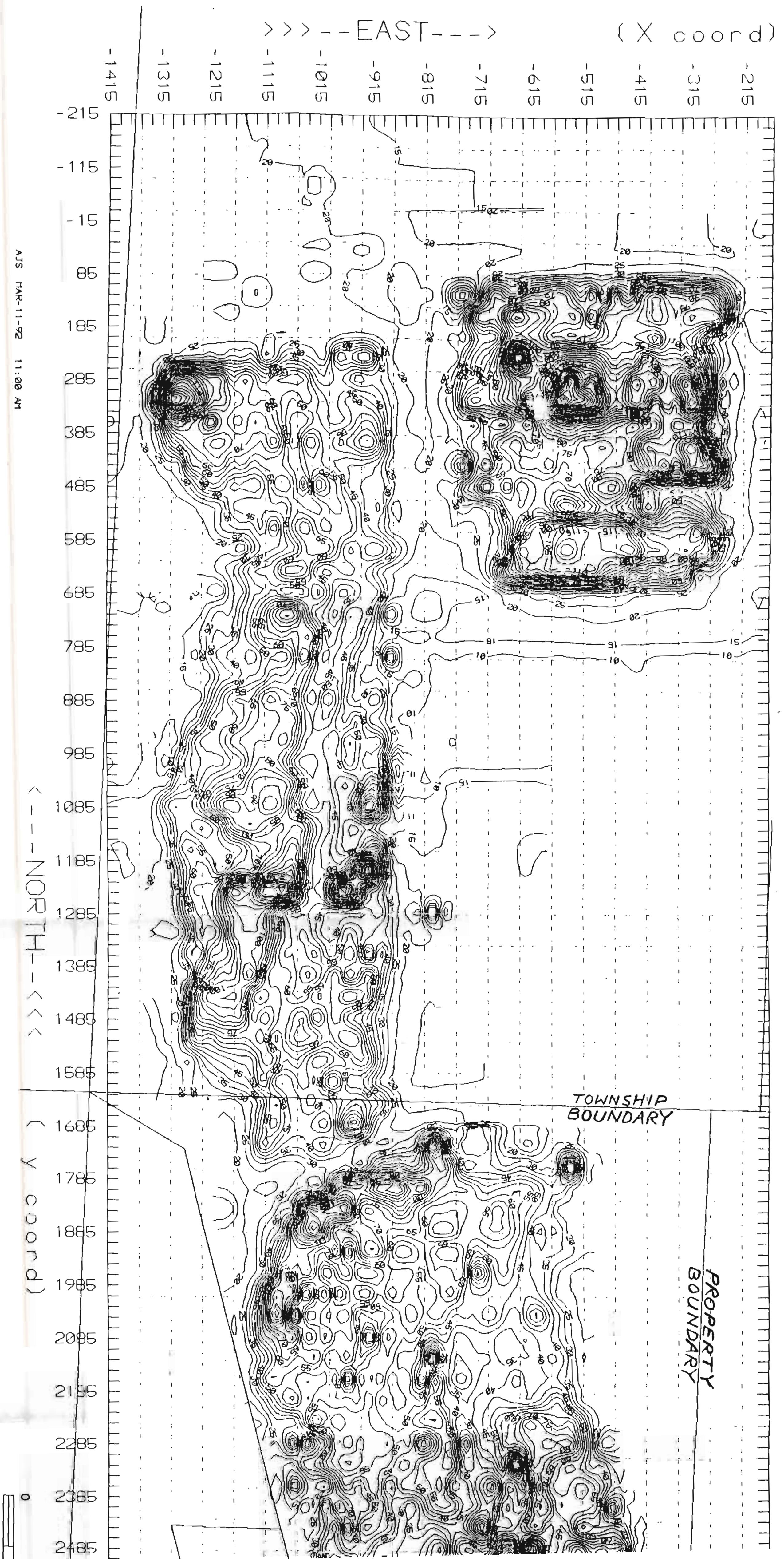
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(X coord)
-1415
-1315
-1215
-1115
-1015
-915
-815
-715
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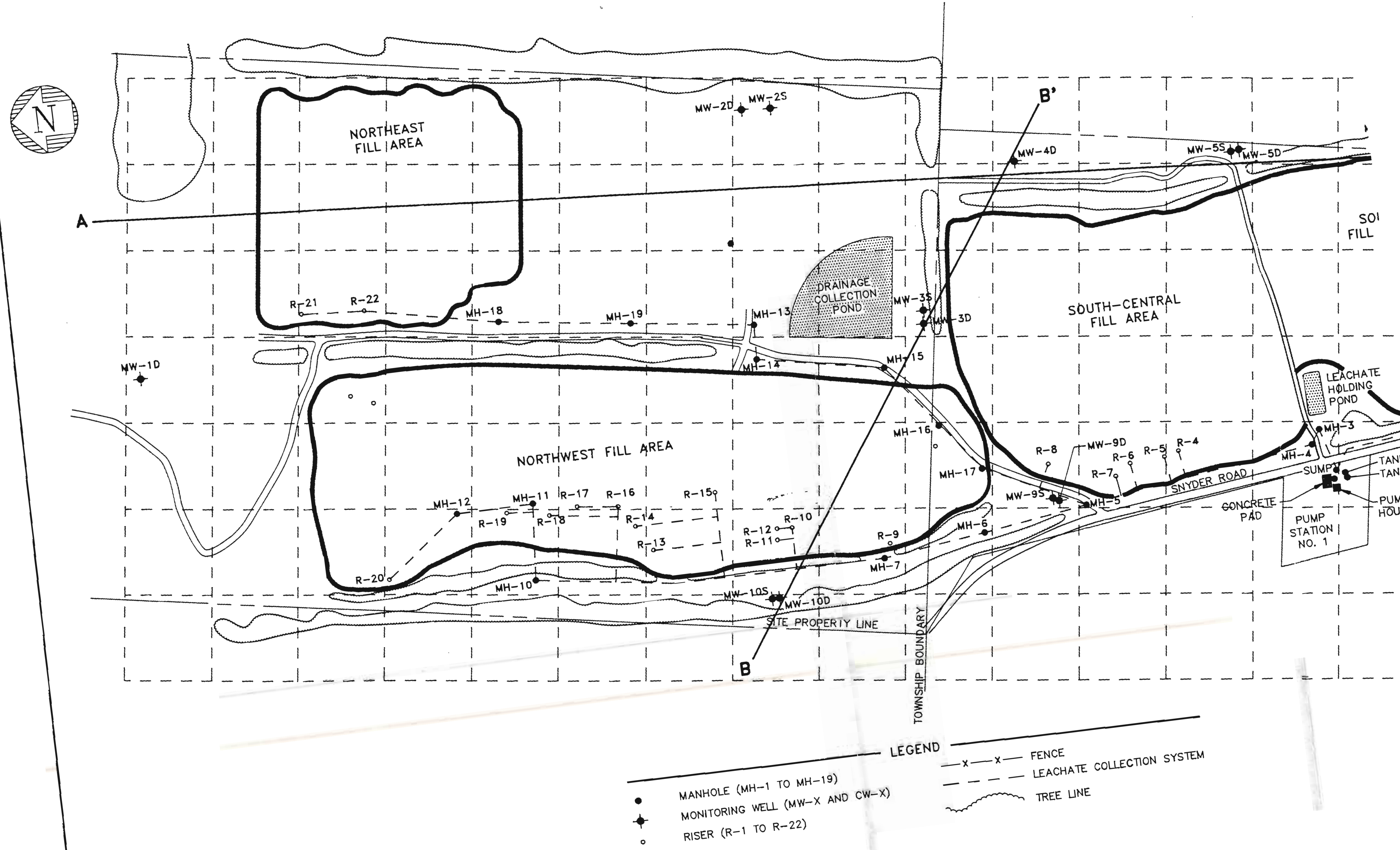
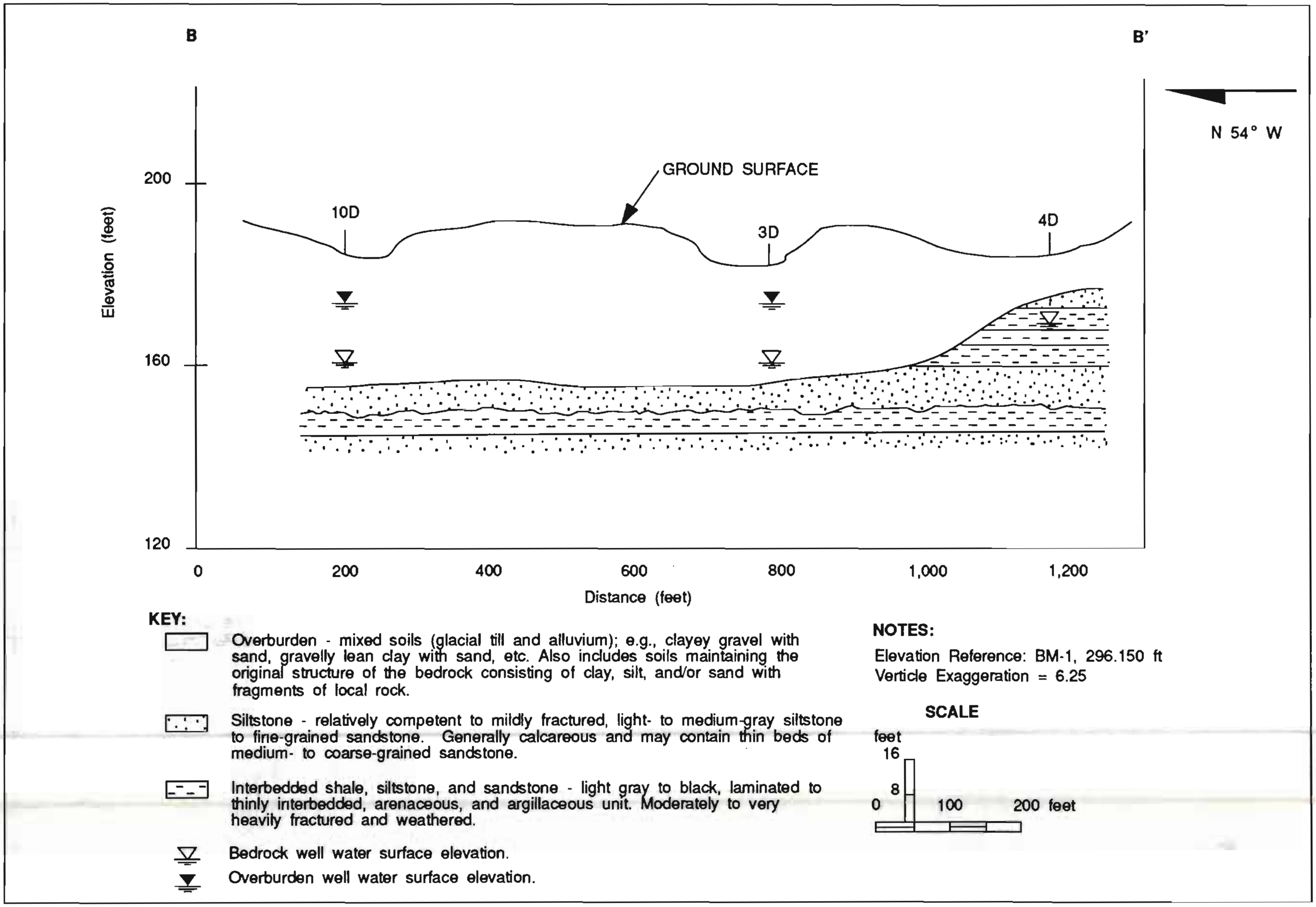
-415
-315
-215
-215
-115
-15
85
185
285
385
485
585
685
785
885
985
1085
1185
1285
1385
1485
1585
1685
1785
1885
1985
2085
2185
2285
2385
2485
<---NORTH--<<<
(y coord)
AJS MAR-11-92 11:00 AM
TOWNSHIP BOUNDARY
PROPERTY BOUNDARY
0

GF

WELLS


N
A
B
B'
NORTHEAST FILL AREA
NORTHWEST FILL AREA
SOUTH-CENTRAL FILL AREA
SOI FILL
DRAINAGE COLLECTION POND
LEACHATE HOLDING POND
PUMP STATION NO. 1
CONCRETE PAD
SUMP
TAN
TAN
PUM HOU
SNYDER ROAD
SITE PROPERTY LINE
TOWNSHIP BOUNDARY
MW-1D
MW-2D
MW-2S
MW-3S
MW-3D
MW-4D
MW-5S
MW-5D
MW-9S
MW-9D
MW-10S
MW-10D
MH-3
MH-4
MH-5
MH-6
MH-7
MH-10
MH-11
MH-12
MH-13
MH-14
MH-15
MH-16
MH-17
MH-18
MH-19
R-4
R-5
R-6
R-7
R-8
R-9
R-10
R-11
R-12
R-13
R-14
R-15
R-16
R-17
R-18
R-19
R-20
R-21
R-22
LEGEND
● MANHOLE (MH-1 TO MH-19)
MONITORING WELL (MW-X AND CW-X)
○ RISER (R-1 TO R-22)
—x—x— FENCE
— — — LEACHATE COLLECTION SYSTEM
TREE LINE



KEY:

- ▭ Overburden - mixed soils (glacial till and alluvium); e.g., clayey gravel with sand, gravelly lean clay with sand, etc. Also includes soils maintaining the original structure of the bedrock consisting of clay, silt, and/or sand with fragments of local rock.
- ▦ Siltstone - relatively competent to mildly fractured, light- to medium-gray siltstone to fine-grained sandstone. Generally calcareous and may contain thin beds of medium- to coarse-grained sandstone.
- ▤ Interbedded shale, siltstone, and sandstone - light gray to black, laminated to thinly interbedded, arenaceous, and argillaceous unit. Moderately to very heavily fractured and weathered.
- ▽ Bedrock well water surface elevation.
- ▼ Overburden well water surface elevation.

NOTES:

Elevation Reference: BM-1, 296.150 ft
Verticle Exaggeration = 6.25

Figure 4-6
GEOLOGIC CROSS SECTION B B'
WELLSVILLE-ANDOVER LANDFILL

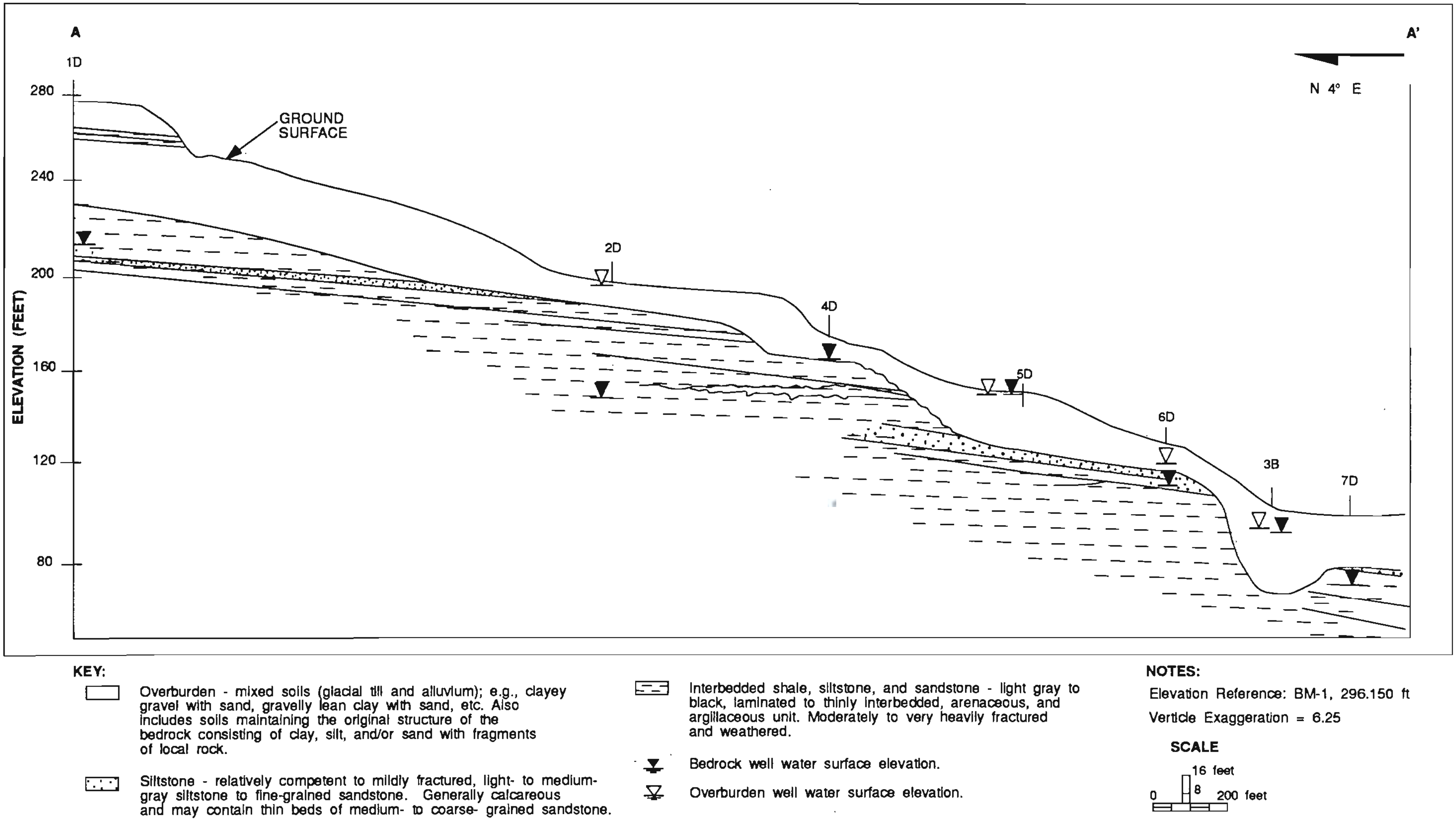
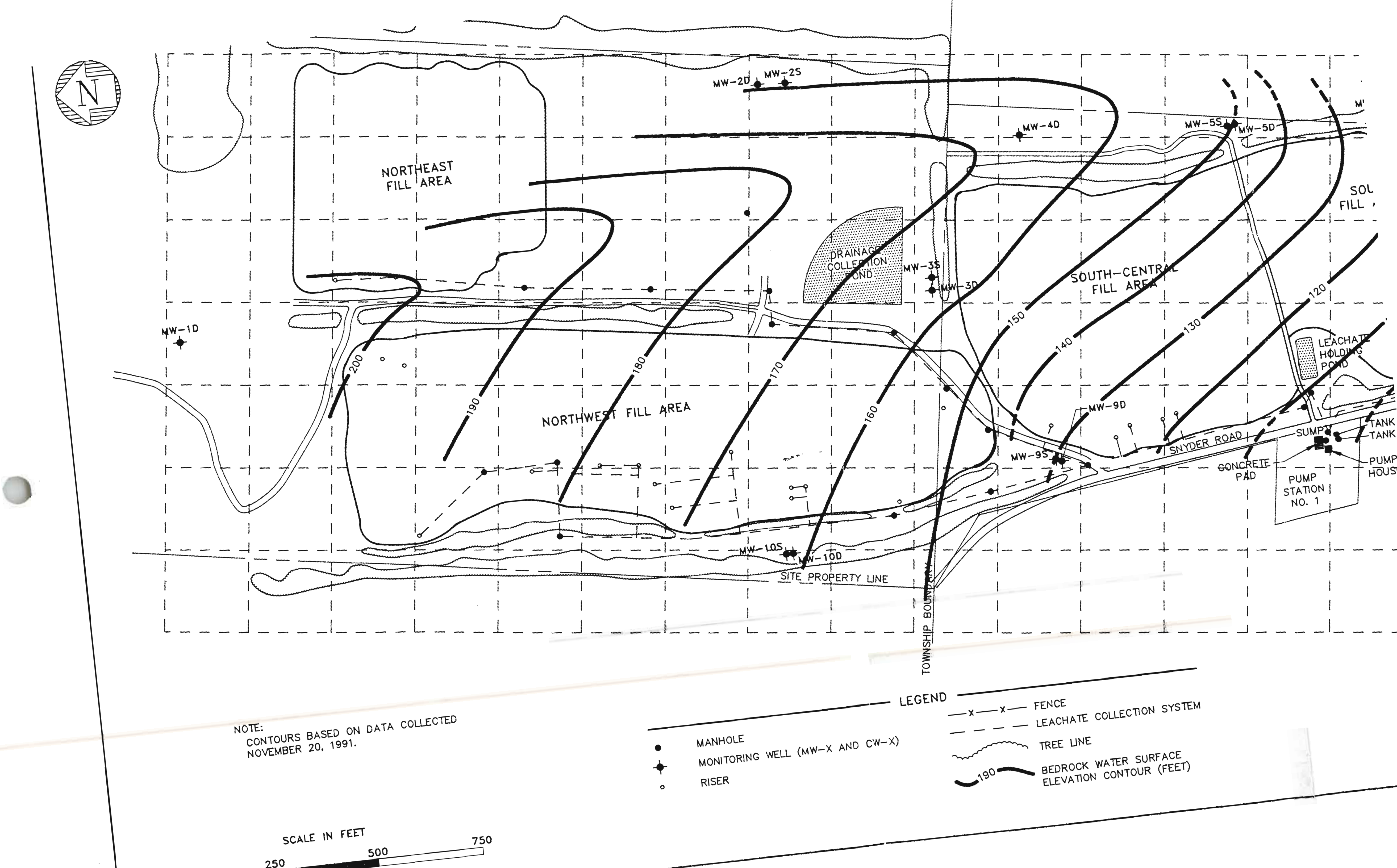


Figure 4-5
GEOLOGIC CROSS SECTION A A'
WELLSVILLE-ANDOVER LANDFILL


NORTHEAST FILL AREA
NORTHWEST FILL AREA
SOUTH-CENTRAL FILL AREA
SOU FILL
DRAINAGE COLLECTION POND
LEACHATE HOLDING POND
MW-1D
MW-2D
MW-2S
MW-3S
MW-3D
MW-4D
MW-5S
MW-5D
MW-9S
MW-9D
MW-10S
MW-10D
200
190
180
170
160
150
140
130
120
SITE PROPERTY LINE
TOWNSHIP BOUNDARY
SNYDER ROAD
CONCRETE PAD
PUMP STATION NO. 1
SUMP
TANK
TANK
PUMP HOUSE
N
LEGEND
MANHOLE
MONITORING WELL (MW-X AND CW-X)
RISER
—x—x— FENCE
— — — LEACHATE COLLECTION SYSTEM
TREE LINE
190 BEDROCK WATER SURFACE ELEVATION CONTOUR (FEET)
NOTE:
CONTOURS BASED ON DATA COLLECTED NOVEMBER 20, 1991.
SCALE IN FEET
250
500
750

5. PHASE I HUMAN HEALTH RISK EVALUATION

5.1 INTRODUCTION

5.1.1 Overview

The Wellsville-Andover Landfill site is an inactive municipal landfill. It is situated on approximately 120 acres and was shared by the towns of Wellsville and Andover in Allegany County, New York.

Between 1960 and 1983, municipal, industrial, and hazardous wastes were disposed of at the Wellsville-Andover Landfill. Some waste that may have been disposed of includes scraps of polymerized polyester, MC, TCE, plastics, sodium cyanide salt, cutting oils, chromium and zinc chromate paints, unspecified solvents, coolants, and lubricating oils (NYSDEC 1983; Village of Wellsville 1986). Each of these products contains, or could contain, a number of chemicals that could potentially pose a threat to human health. The objective of this phase of the risk evaluation is to determine whether chemicals associated with the site could potentially pose such a threat. This determination will be accomplished by the following:

- Comparison of site analytical data to appropriate background levels, and standards and guidelines set forth by NYSDEC, NYSDOH, and the United States Environmental Protection Agency (EPA);
- Selection of chemicals of potential concern (COPCs);
- Discussion of potential exposure pathways and receptors; and
- Discussion of toxicological properties of the COPCs.

5.1.2 Site Description and Setting

The Wellsville-Andover Landfill is located in a sparsely populated, rural area of Allegany County, New York. A number of permanent and seasonal residences are located along Duffy Creek, approximately 1,400 to 1,500 feet east of the site. In addition, one seasonal residence is located 600 feet southeast of the site, one is situated about 500 feet west of the site, and one permanent and one seasonal residence are located within 300 feet of the landfill to the west. The western side of the site is otherwise bounded by a mature beech and sugar maple forest. No schools, parks, or other public facilities are located in the immediate vicinity of the site, and the demographics of the area suggest the nearby population would not be expected to include exceptionally high percentages of potentially sensitive subpopulations such as young children or the elderly.

The site is unpaved, with most of the area covered by grasses. Dirt access roads pass through the site, and the site is easily approachable from all sides. A barbed wire fence exists at the southern border of the site, and some patches of mature beech and sugar maple forests remain on the eastern side of the site. No natural barriers exist that would hinder the approach and entrance of wildlife or humans. In fact, the northernmost area of the site, on top of a hill at an approximate elevation of 2,230 feet, is used for recreational purposes by the Wellsville Area Small Plane Society, a local community group. Access to this portion of the site is gained by one of the dirt roads that crosses the site.

Although no streams cross the site, an unnamed tributary begins along the west side of the site and flows south-southeast until it converges with Duffy Creek approximately 3,000 feet southeast of the site. Duffy Creek is a Class C stream, indicating that its best potential use is to support fish propagation. A number of man-made ditches are also present at the site and divert surface runoff away from the filled areas. All surface runoff is eventually diverted to the unnamed tributary west of the site.

Groundwater in the area flows from north to southwest in the central and western portion of the landfill. A groundwater divide exists along the east side of the site, and groundwater on the east side flows toward Duffy Creek. A portion of the groundwater at the site emerges in springs south and east of the site. Both permanent and seasonal residences in the area utilize private wells and springs for drinking water supply purposes.

5.2 SUMMARY OF SITE INVESTIGATION

The site investigation focused on characterizing the nature and extent of contamination associated with the site and identifying potential migration pathways that could result in exposure of human receptors to site contaminants. Samples were collected from a variety of media and locations at the site, including:

- Landfill gas;
- Landfill leachate;
- Surface soils from drainage ditches and seep areas on and around the landfill;
- Subsurface soils and waste materials from the landfill;
- Subsurface soils from borings around the landfill;

- Surface water from streams draining the site;
- Stream sediments;
- Groundwater from monitoring wells on and around the site; and
- Groundwater samples from residential wells and springs near the site that are used for drinking water supply purposes.

A summary of contaminants detected at the site can be found in Tables 5-1 through 5-9. The chemicals of potential concern (COPCs) were selected based on the analytical results for all media sampled. The COPCs selected are indicated by an asterisk in Tables 5-1 through 5-9 and are summarized in Table 5-10.

Samples from all media except air show cobalt, iron, manganese, and zinc at elevated levels. These elevated concentrations seem to occur throughout the area and are not necessarily site-derived. Lead was found in some leachate, surface water, and groundwater samples at levels above relevant criteria. However, when present at such levels, it was usually accompanied by elevated aluminum concentrations, which are indicative of suspended soil minerals (sediment) in the samples. Lead and other metals are natural constituents of soil minerals; therefore, these elevated lead levels are probably not related to waste materials. Lead associated with soil minerals in such samples is unlikely to pose a threat to human health or the environment; therefore, lead was not selected as a COPC.

The leachate sample taken from Pump Station 2 in the southwest corner of the site exhibited an elevated concentration of TCE. Groundwater in that area contained levels of TCE that were above both the NYSDOH MCL and the NYSDEC Class GA groundwater standard. This groundwater also contained elevated concentrations of 1,1-DCE; total 1,2-DCE; and VC. One residential spring sample collected further south of the site, on the LaDue property, also contained detectable levels of TCE. Other site groundwater samples, most notably one taken from the south-southeast portion of the site, contained elevated concentrations of toluene as well as all of the organic contaminants previously discussed. No organic chemicals were detected in surface water samples. Lead was detected at levels above its NYSDEC Class C surface water standard, but these occurrences appear to be due to suspended sediment, as discussed above.

Some PAHs were found in the surface soil sample taken from the southwest corner of the site and in subsurface soil/waste material samples. The levels found were comparable to concentrations for PAHs in rural soils reported in the ASTDR toxicological profile for PAHs. Therefore, PAHs were not selected as COPCs at this site. 1,2-DCE, TCE, and VC were detected in the subsurface soil taken from the south-southeast portion of the site and were selected as COPCs. No other soil samples contained elevated levels of organic contaminants.

5.3 CONTAMINANT MIGRATION AND EXPOSURE PATHWAYS

Contaminants in the environmental media at the Wellsville-Andover Landfill site seem to be located primarily at the southwest corner of the site, at the southern border of the site where a leachate sump overflowed, and in the south-southeast portion of the site. Although historical data have shown the presence of organic contamination in downgradient residential wells and springs, the only potable water contamination found in this study was the presence of TCE in the LaDue spring. This may be due to the overflow of the leachate sump at the southern border of the site or to groundwater contamination originating elsewhere on site. This was the only evidence of off-site contaminant migration found by the Phase I study.

Potential exposure pathways are shown schematically in Figure 5-1, the conceptual site model. Substantial concentrations of several VOCs were found in landfill gas samples. Investigations at other landfills have shown VOC concentrations in ambient air are usually at least 1,000 times lower than in the landfill gas or soil gas. Therefore, the NYSDEC annual guidance concentrations (AGC), which apply to ambient air, were multiplied by 1,000 in order to obtain suitable benchmarks for evaluating the significance of the landfill gas concentrations.

Chemicals were selected as COPCs if they were detected at concentrations exceeding NYSDEC and NYSDOH criteria, and if their presence at those concentrations in more than one medium suggests they are site-related chemicals. COPCs selected as a result of this evaluation are marked with an asterisk in Tables 5-1 through 5-9, and are listed separately in Table 5-10.

Waste materials placed in the landfill were covered with clean fill. Therefore, direct contact with waste materials is not a potential exposure pathway. The sampling results did not reveal the presence of contaminants in surface soils, surface water, or stream sediments. Therefore, direct contact with contaminants on most of the site and adjacent areas also does not appear to be a complete exposure pathway.

One leachate sample contained TCE at a level above its NYSDOH MCL and its NYSDEC Class C surface water standard. However, this sample was from a manhole well upstream in the leachate collection system from the leachate collection pond, and samples taken from manholes closer to the pond did not reveal contamination above criteria values. Thus, direct contact with contaminants in the leachate collection pond or overflow areas also does not appear to be a viable exposure pathway.

COPCs were detected in landfill gas samples from the leachate collection system at levels above benchmark concentrations. These volatile organic chemicals could migrate to the landfill surface and into the ambient air, where site visitors and nearby residents might inhale them. This is a potentially complete exposure pathway.

COPCs were found in site groundwater and also in one off-site residential spring. Some of the same contaminants also have been found historically in other domestic wells downgradient of the site. Water from these wells is used for general domestic supply purposes. Thus, residents could potentially be exposed to contaminants in the water by drinking the water or by showering or bathing in it. Since the COPCs in the groundwater are VOCs, they might also migrate from the groundwater via soil gas into ambient air or even indoor air in areas downgradient from the landfill. If this were to occur, nearby residents might also be exposed to site contaminants through inhalation of the air.

5.4 HEALTH EFFECTS SUMMARIES

The health effects summaries describe the potential toxic properties of the COPCs at the Wellsville-Andover Landfill site. In most cases, the majority of the information is drawn from the public health statement in the Agency for Toxic Substances and Disease Registry's (ATSDR) toxicological profile for the given chemical (ATSDR 1988-1991).

In cases where the EPA has evaluated the carcinogenicity of a chemical, its classification has been listed. These classifications are:

Group A:	Human carcinogen; sufficient evidence from epidemiological studies
Group B:	Probable human carcinogen
	B1: At least limited evidence of carcinogenicity to humans
	B2: Usually a combination of sufficient evidence for animals and inadequate data for humans
Group C:	Possible human carcinogen; limited evidence of carcinogenicity in animals and an absence of human data
Group D:	Not classified; inadequate animal evidence of carcinogenicity
Group E:	Non-carcinogen; no evidence of carcinogenicity in animals or man.

1,1-Dichloroethane (1,1-DCA)

1,1-DCA is a man-made liquid chemical that is used industrially as a solvent and in the manufacture of other chemicals. When 1,1-DCA is released to surface water or surface soil, the chemical will evaporate into air. Though solubility is low, 1,1-DCA can migrate from soil into groundwater. Some 1,1-DCA found in the environment is a breakdown product of 1,1,1-trichloroethane. Human exposure to 1,1-DCA can result from breathing contaminated air or eating or drinking contaminated food or water.

Relatively little information is available on the health effects of 1,1-DCA in humans or animals. 1,1-DCA was once used as a surgical anesthetic gas, although this use was discontinued when it was discovered that irregular heartbeats were induced at anesthetic doses. Exposure to high levels of 1,1-DCA in air has caused death in animals. Long-term exposure to high levels of 1,1-DCA has caused kidney damage in laboratory animals. In addition, exposure of pregnant rats to 1,1-DCA in air resulted in delayed development in the offspring. There is no evidence of similar harmful health effects in humans. In light of the results of animal studies, EPA has classified 1,1-DCA as a Group C possible human carcinogen.

1,1-Dichloroethene (1,1-DCE)

1,1-DCE is a man-made chemical. It is a clear, colorless liquid that has a mild, sweet, chloroform-like odor. 1,1-DCE is used to make plastic products such as plastic films for wrapping foods, and flame-retardant fabrics.

Although 1,1-DCE does not occur naturally, it has been detected in the air near factories that make or use it and at some chemical waste sites. Surveys of U.S. drinking water supplies have shown that a small percentage of those supplies also contain detectable amounts of 1,1-DCE.

High levels of exposure to 1,1-DCE can occur among plant workers while making or using it. 1,1-DCE usually enters the body via inhalation and/or ingestion. It may also enter the body through the skin. The health effects resulting from human exposure to 1,1-DCE are unknown.

In animal studies, brief exposures to high concentrations of 1,1-DCE have caused liver, kidney, heart, and lung damage; nervous system disorders; and death. Prolonged exposure to lower concentrations has also resulted in liver damage. In one study, an increased incidence of cancer was observed in animals exposed to 1,1-DCE. Based upon this study, 1,1-DCE is classified as a Group C, or possible human carcinogen, by the EPA.

1,2-Dichloroethene (1,2-DCE)

1,2-DCE is a man-made flammable liquid that has a sharp, harsh odor. It is used primarily in the production of solvents and as an additive to dyes, lacquer solutions, perfumes, and thermoplastics. There are two forms of 1,2-DCE: cis-1,2-DCE and trans-1,2-DCE. These may occur separately or as a mixture.

If 1,2-DCE is released to surface soil or surface water, almost all of the chemical rapidly evaporates. If it is placed underground, such as in a landfill or chemical waste site, 1,2-DCE can migrate to groundwater. In groundwater, 1,2-DCE breaks down slowly, mainly to VC, a chemical more toxic than 1,2-DCE.

Because it evaporates so readily, inhalation is the most likely route of human exposure to 1,2-DCE. Inhalation of high levels of 1,2-DCE can cause nausea, dizziness, and drowsiness and may result in death. Liver, heart, and lung damage were observed in laboratory animals after short- and long-term exposure to 1,2-DCE in air.

1,2-DCE can also enter the body by drinking water or eating food contaminated with 1,2-DCE. Animals fed 1,2-DCE were reported to incur liver and lung damage. 1,2-DCE is classified as a Group D chemical and is not considered a carcinogen.

Vinyl Chloride (VC)

VC is a gas or pressurized liquid used by the chemical manufacturing industry in the production of polymeric chemicals that are in turn used to manufacture a variety of vinyl and plastic products. VC is present in tobacco smoke. Additionally, it is a known environmental degradation product of many chlorinated chemicals.

When released to surface water or soil, VC readily evaporates. Once in the air, it rapidly breaks down to nonhazardous chemicals. In groundwater, VC can eventually break down to non-toxic substances (carbon dioxide, water, and chloride ions); however, VC can persist for many years before this process is complete.

Adverse health effects may occur as a result of inhalation or ingestion of VC, or by dermal or eye contact with it. Inhalation of high levels of VC can cause dizziness or sleepiness. Unconsciousness, and in some cases death, may result from breathing very high levels of VC. Skin contact with VC can result in redness and blistering of the skin. Noncarcinogenic effects associated with long-term occupational exposure to VC include hepatitis-like changes in the liver, immune system reactions, and nerve damage.

Occupational exposure to VC concentrations in air of about 25 ppm or greater has been shown to cause liver cancer. Liver and lung cancers have also been seen in rats exposed to VC.

Based upon this evidence, VC is classified by the EPA as a Group A, or known human, carcinogen.

Toluene

Toluene is a clear, colorless liquid with a sweet smell; it occurs naturally in crude oil and the tolu tree. Toluene is produced in petroleum refining and as a byproduct of styrene production and coke oven operations. It is primarily used by industry in gasoline refining and chemical manufacturing. Toluene is used in solvents, paints, inks, adhesives, cleaning agents, and chemical extractions. Toluene is also used in the manufacture of benzene, urethane foams, pharmaceuticals, dyes, and cosmetic nail products.

Toluene is volatile, and when released to surface water and soil, tends to evaporate quickly. Non-volatilized toluene undergoes microbial degradation and, therefore, does not tend to build up over time.

Inhalation and ingestion of, and dermal contact with, toluene liquid or vapor can result in short-term, intermediate, and long-term health effects. The toxicity of toluene, primarily by inhalation exposure, has been investigated in both humans and animals. The central nervous system (CNS) seems to be the system primarily affected by toluene.

In humans, acute inhalation exposure can cause depression of the CNS. Acute exposure to higher concentrations of toluene can produce unconsciousness and impaired neuromuscular function. At still higher levels, long-term effects may include permanent damage, such as cerebral and cerebellar effects including ataxia and tremors, and speech, hearing, and vision impairment.

Inhalation exposure of animals to moderate levels of toluene may be associated with CNS depression, while lower exposure levels can cause subtle behavioral and neurological effects. Animal studies indicate that toluene is a developmental toxicant.

Toluene is classified as a Group D chemical and has not been associated with cancer in humans or animals.

Trichloroethene (TCE)

TCE is a man-made liquid. It is used as a cleaning agent and solvent for degreasing operations. TCE may be found in metal cleaners, spot removers, rug-cleaning fluids, paints, and paint removers.

TCE is a volatile chemical that readily evaporates to the air from surface water and soil. Although it is relatively persistent in subsurface soil, it breaks down in air and water. Some of the products of TCE breakdown are hazardous chemicals such as VC.

Adverse health effects may result from exposure to TCE via inhalation, ingestion, or skin or eye contact. Chronic exposure to TCE could cause liver damage, skin reactions, and CNS effects. CNS effects include drowsiness, dizziness, headache, blurred vision, lack of coordination, mental confusion, flushed skin, tremors, nausea, vomiting, fatigue, heart arrhythmia, and in some cases, death.

Exposure of laboratory animals to TCE has been associated with an increased incidence of a variety of tumors, including kidney, liver, and lung tumors. TCE is thus considered a Group B2, or probable human, carcinogen by the EPA.

5.5 CONCLUSION

In this first phase of the risk evaluation for the Wellsville-Andover Landfill site, the analytical results of site samples were compared to background contaminant levels and applicable NYSDEC, NYSDOH, and EPA criteria. COPCs were chosen based on this comparison process and are listed in Table 5-10. These contaminants include 1,1-DCA; 1,1-DCE; 1,2-DCE; toluene; TCE; and VC.

The only pathway by which site visitors might experience significant exposure to site contaminants is through inhalation of vapors that could migrate from the landfill gas to the ambient air. The Phase I sampling results indicate that COPCs are not present in other environmental media (soil, surface water, or sediment) on or adjacent to the site with which site visitors are likely to come into contact.

Pathways by which nearby residents could be exposed to site contaminants are ingestion of, and dermal contact with, contaminated water used for domestic supply purposes; inhalation of chemicals volatilized from the water while showering or bathing; and inhalation of COPCs in indoor or outdoor air that might have migrated to these locations from the groundwater by way of soil gas.

Adverse effects that might occur as a result of these possible exposures have also been discussed in this phase of the evaluation and can be found in Section 5.4, Health Effects Summaries.

Table 5-1

SUMMARY OF CONTAMINANTS DETECTED IN LANDFILL GAS SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (ppb)		1000x NYSDEC AGC (ppb)[a]	Exceedance Frequency
		Minimum	Maximum		
Volatile Organic Compounds					
Benzene	2/6	113	240	38	2/6
Chloroethane	2/6	60	820	NA	NA
1,1-Dichloroethane*	4/6	4	1,700	124,000	0/6
cis-1,2-Dichloroethene*	6/6	2	87,000	479,000	0/6
Ethylbenzene	6/6	19	21,000	230,000	0/6
Freon®11	2/6	180	210	125,000	0/6
Freon®12	3/6	12	27	NA	NA
Freon®114	2/6	2	980	NA	NA
Methylene chloride	1/6	--	860	7,770	0/6
1,2,4-Trichlorobenzene	1/6	--	2	1,210	0/6
1,1,1-Trichloroethane	2/6	800	2,300	183,000	0/6
Trichloroethene*	2/6	2	390	80	1/6
1,2,4-Trimethylbenzene	1/6	--	34	59,000	0/6
Toluene*	6/6	3	8,600	531,000	0/6
Vinyl chloride*	6/6	11	12,000	8	6/6
m,p-Xylene	5/6	34	1,800	69,000	0/6
o-Xylene	2/6	5	290	161,000	0/6

* Chemical of potential concern.

[a] Annual Guidance Concentration (NYSDEC 1991c) converted from $\mu g/m^3$ to ppb and multiplied by 1,000 (see text for explanation).

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Table 5-2

SUMMARY OF CONTAMINANTS DETECTED IN LEACHATE SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (µg/L)		NYSDEC Class C Surface Water Standard (µg/L)[a]	Exceedance Frequency
		Minimum	Maximum		
INORGANIC SUBSTANCES					
Aluminum	2/2	774	27,600	100	2/2
Arsenic	1/2	--	12.5	190	0/2
Barium	2/2	406	577	NA	NA
Calcium	2/2	123,000	191,000	NA	NA
Chromium	2/2	15.2	39.9	962 / 791[b]	0/2
Cobalt	2/2	55.4	58.4	5	2/2
Copper	1/2	--	35.2	58.8 / 47.9[b]	0/2
Iron	2/2	71,900	165,000	300	2/2
Lead	2/2	27.2	47.9	34.6 / 25.6[b]	2/2
Magnesium	2/2	42,800	50,300	NA	NA
Manganese	2/2	1,880	3,670	NA	NA
Nickel	1/2	--	54.5	398 / 332[b]	0/2
Potassium	2/2	33,400	50,700	NA	NA
Sodium	2/2	33,600	71,500	NA	NA
Vanadium	1/2	--	52.2	14	1/2
Zinc	2/2	151	227	30	2/2
ORGANIC SUBSTANCES					
Volatiles					
Chlorobenzene	1/2	--	3	5	0/2
total 1,2-Dichloroethene*	2/2	2	8	NA	NA
Trichloroethene*	2/2	2	14	11	1/2

Key at end of table.

Table 5-2

SUMMARY OF CONTAMINANTS DETECTED IN LEACHATE SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (µg/L)		NYSDEC Class C Surface Water Standard (µg/L)[a]	Exceedance Frequency
		Minimum	Maximum		
ORGANIC SUBSTANCES (CONT.)					
Semi-Volatiles					
4-Chloro-3-methyl phenol	1/2	--	4	1[c]	1/2
1,4-Dichlorobenzene	1/2	--	1	5[d]	0/2
Di-n-butyl phthalate	1/2	--	2	NA	NA
Naphthalene	1/2	--	1	NA	NA
n-Nitrosodiphenylamine	1/2	--	1	NA	NA

* Contaminant of potential concern.

[a] NYSDEC 1991.

[b] Standard is a function of hardness; first value is for sample L-1, and second value is for sample L-2.

[c] Standard applies to total chlorinated phenols.

[d] Standard applies to the sum of ortho, meta, and para isomers.

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Page 1 of 5

Table 5-3

SUMMARY OF CONTAMINANTS DETECTED IN SUBSURFACE SOIL/WASTE MATERIALS FROM TRENCHES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Background Concentration (mg/kg)[b]	Exceedance Frequency	Benchmark Health Risk Value (mg/kg)[a]	Exceedance Frequency
		Minimum	Maximum				
INORGANIC SUBSTANCES							
Aluminum	5/5	9,450	14,600	128,000	0/5	NA	NA
Arsenic	5/5	11.5	20.9	16	1/5	80	0/5
Barium	5/5	85.7	215	867	0/5	4,000	0/5
Calcium	5/5	1,610	9,890	14,400	0/5	NA	NA
Chromium	5/5	18.2	28.8	112	0/5	80,000	0/5
Cobalt	5/5	20.8	28.1	19.8	5/5	NA	NA
Copper	5/5	25.4	194	48.7	1/5	3,000[c]	0/5
Iron	5/5	23,900	38,300	54,100	0/5	NA	NA
Lead	5/5	15.3	86.9	33	4/5	250	0/5
Magnesium	5/5	3,330	5,070	10,700	0/5	NA	NA
Manganese	5/5	422	784	1,450	0/5	20,000	0/5
Nickel	5/5	31.9	43.2	38.2	1/5	2,000	0/5
Potassium	5/5	1,570	2,160	23,500	0/5	NA[d]	NA
Vanadium	5/5	15.1	26.2	140	0/5	600	0/5
Zinc	5/5	87.4	269	104	4/5	20,000	0/5

Key at end of table.

02:D3716-03/13/92-D1

Table 5-3

SUMMARY OF CONTAMINANTS DETECTED IN SUBSURFACE SOIL/WASTE MATERIALS FROM TRENCHES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Health Risk Value (mg/kg)^{a}	Exceedance Frequency
		Minimum	Maximum		
ORGANIC SUBSTANCES					
Volatiles					
Acetone	4/5	0.23	4.5	6,000	0/5
Benzene	1/5	--	0.078	24	0/5
2-Butanone	2/5	0.075	0.49	NA	NA
1,1-Dichloroethane*	1/5	--	0.71	8,000	0/5
total 1,2-Dichloroethene*	4/5	0.021	3.9	800^{e} (as cis-)	0/5
Ethylbenzene	5/5	0.031	33	8,000	0/5
2-Hexanone	2/5	0.044	0.12	NA	NA
Methylene chloride	1/5	–	0.11	93	0/5
4-Methyl-2-pentanone	1/5	--	0.26	NA	NA
Styrene	2/5	0.045	4.2	23	0/5
Tetrachloroethene	1/5	--	0.52	14	0/5
Toluene*	5/5	0.011	3.2	20,000	0/5
Trichloroethene*	2/5	0.073	5.3	64	0/5
Vinyl chloride*	1/5	--	0.98	0.36	1/5
Total xylenes	4/5	0.051	1.7	200,000	0/5

Key at end of table.

Table 5-3

SUMMARY OF CONTAMINANTS DETECTED IN SUBSURFACE SOIL/WASTE MATERIALS FROM TRENCHES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Health Risk Value (mg/kg)^a	Exceedance Frequency
		Minimum	Maximum		
ORGANIC SUBSTANCES (CONT.)					
Semivolatiles					
Benzo(a)fluoranthene	1/5	--	0.37	0.22	1/5
Benzo(a)pyrene	1/5	--	0.28	0.061	1/5
Benzyl alcohol	1/5	--	1.2	20,000	0/5
Bis(2-ethylhexyl)phthalate	5/5	0.13	8.3	50	0/5
Butylbenzylphthalate	3/5	1.0	16	20,000	0/5
4-Chloro-3-methylphenol	1/5	--	0.30	NA	NA
Chrysene	1/5	--	0.41	NA	NA
Di-n-butylphthalate	4/5	0.049	14	8,000	0/5
1,2-Dichlorobenzene	2/5	0.67	1.2	7,000	0/5
Diethylphthalate	2/5	0.025	0.11	60,000	0/5
Dimethylphthalate	2/5	0.53	0.91	80,000	0/5
Fluoranthene	3/5	0.28	0.72	3,000	0/5
2-Methylnaphthalene	2/5	0.18	0.19	NA	NA
4-Methylphenol	4/5	0.37	1.6	NA	NA

Key at end of table.

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Table 5-3

SUMMARY OF CONTAMINANTS DETECTED IN SUBSURFACE SOIL/WASTE MATERIALS FROM TRENCHES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Health Risk Value (mg/kg)^a	Exceedance Frequency
		Minimum	Maximum		
ORGANIC SUBSTANCES (CONT.)					
Semivolatiles (Cont.)					
Naphthalene	2/5	0.14	0.15	300	0/5
Pentachlorophenol	1/5	--	6.6	2,000	0/5
Phenanthrene	3/5	0.13	0.61	NA	NA
Pyrene	3/5	0.19	0.53	2,000	0/5
Pesticides					
beta-BHC	1/5	--	0.012	3.9	0/5
Dieldrin	1/5	--	0.013	0.044	0/5
4,4'-DDD	2/5	0.043	0.12	2.9	0/5
4,4'-DDE	1/5	--	0.015	2.1	0/5
4,4'-DDT	1/5	--	0.13	2.1	0/5

Key at end of table.

Table 5-3 (Cont.)

*Contaminant of potential concern.

[a] Guidance derived from direct ingestion pathway (NYSDEC 1991c).
[b] Upper 90th percentile of concentrations in eastern U.S. soils (Shacklette and Boerngen 1984);
[c] RCRA CMS action level for soil (USEPA 1990).
[d] NYSDEC value was derived from potassium cyanide and is inappropriate for this use.
[e] Derived from cis-1,2-Dichloroethene.

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

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Table 5-4

SUMMARY OF CONTAMINANTS DETECTED IN SURFACE WATER

Chemical	Detection Frequency	Range of Detected Concentrations (μg/L)		Class C Surface Water Standard (μg/L)[a]	Exceedance Frequency
		Minimum	Maximum		
INORGANIC SUBSTANCES					
Aluminum	5/6	137	874	100	5/6
Calcium	6/6	15,400	19,800	NA	NA
Iron	6/6	130	3,840	300	4/6
Lead	6/6	1.1	4.8	1.48 - 1.90[b]	3/6
Magnesium	5/6	6,360	7,200	NA	NA
Manganese	4/6	68.5	3,090	NA	NA
Sodium	5/6	8.980	22,100	NA	NA
ORGANIC SUBSTANCES					
Semi-Volatiles					
Di-n-butyl phthalate	4/6	1	2	NA	NA
Di-n-octyl phthalate	1/6	--	2	NA	NA

[a] NYSDEC 1991.
[b] Standard is a function of hardness.

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Table 5-5

SUMMARY OF CONTAMINANTS DETECTED IN SEDIMENT SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Background Concentrations (mg/kg)^b	Exceedance Frequency	NYSDEC Aquatic Sediment Criteria (mg/kg)^a	Exceedance Frequency
		Minimum	Maximum				
INORGANIC SUBSTANCES							
Aluminum	6/6	1,000	15,700	128,000	0/6	NA	NA
Arsenic	6/6	8.1	13.5	16	0/6	5	6/6
Barium	6/6	97.4	192	867	0/6	NA	NA
Calcium	2/6	1,290	2,010	14,400	0/6	NA	NA
Chromium	6/6	18.3	22.7	112	0/6	26	0/6
Cobalt	6/6	25.4	27.9	19.8	6/6	NA	NA
Copper	6/6	15.7	21.4	48.7	0/6	19	2/6
Iron	6/6	32,400	43,200	54,100	0/6	24,000	6/6
Lead	6/6	3.2	26.1	33	0/6	27	0/6
Magnesium	6/6	3,510	4,640	10,700	0/6	NA	NA
Manganese	6/6	798	2,440	1,450	2/6	428	6/6
Nickel	6/6	33.4	40.1	38.2	2/6	22	6/6
Potassium	1/6	--	1,070	23,500	1/6	NA	NA
Vanadium	6/6	17.5	23.4	140	0/6	NA	NA
Zinc	6/6	76.1	107	104	1/6	85	3/6

Key at end of table.

Table 5-5

SUMMARY OF CONTAMINANTS DETECTED IN SEDIMENT SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Background Concentrations (mg/kg)[b]	Exceedance Frequency	NYSDEC Aquatic Sediment Criteria (mg/kg)[a]	Exceedance Frequency
		Minimum	Maximum				
ORGANIC SUBSTANCES							
Volatiles							
Acetone	5/6	0.01	0.035	NA	NA	NA	NA
Semi-Volatiles							
Butylbenzylphthalate	1/6	--	0.024	NA	NA	NA	NA

[a] Geometric mean of "no-effect" and "lowest effect" levels based on studies in benthic organisms (NYSDEC 1991c).
[b] Upper 90th percentile of concentrations in eastern U.S. soils (Schacklette and Boerngen 1984).

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Table 5-6

SUMMARY OF CONTAMINANTS DETECTED IN SURFACE SOIL SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Background Concentrations (mg/kg)^b	Exceedance Frequency	Benchmark Health Risk Value (mg/kg)^a	Exceedance Frequency
		Minimum	Maximum				
INORGANIC SUBSTANCES							
Aluminum	14/14	1,030	14,300	128,000	0/14	NA	NA
Arsenic	14/14	4.0	13.5	16	0/14	80	0/14
Barium	14/14	43.9	741	867	0/14	4,000	0/14
Calcium	8/14	1,680	173,000	14,400	2/14	NA	NA
Chromium	14/14	12.9	40.4	112	0/14	80,000	0/14
Cobalt	14/14	17.7	87.3	19.8	13/14	NA	NA
Copper	13/14	6.6	28.2	48.7	0/14	3,000^c	0/14
Iron	14/14	23,800	283,000	54,100	3/14	NA	NA
Lead	14/14	13.2	56.1	33	2/14	250	0/14
Magnesium	14/14	1,710	9,060	10,700	0/14	NA	NA
Manganese	14/14	235	4,540	1,450	2/14	20,000	0.14
Nickel	14/14	15.8	88	38.2	4/14	2,000	0/14
Potassium	10/14	1,300	2,250	23,500	0/14	NA^d	0/14
Vanadium	13/14	14.4	25.6	140	0/14	600	0/14
Zinc	14/14	43	356	104	3/14	20,000	0/14
Cyanide	1/14	--	3.5	NA	NA	2,000	0/14

Key at end of table.

Table 5-6

SUMMARY OF CONTAMINANTS DETECTED IN SURFACE SOIL SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Background Concentrations (mg/kg)^b	Exceedance Frequency	Benchmark Health Risk Value (mg/kg)^a	Exceedance Frequency
		Minimum	Maximum				
ORGANIC SUBSTANCES							
Volatiles							
Acetone	1/14	--	0.240	NA	NA	6,000	0/14
Chloromethane	1/14	--	0.040	NA	NA	NA	NA
Ethylbenzene	2/14	0.001	0.018	NA	NA	8,000	0/14
Semi-Volatiles							
Anthracene	1/14	--	0.014	NA	NA	20,000	0/14
Benzo(b)fluoranthene	2/14	0.034	0.140	0.020 - 0.030	2/14	0.22	0/14
Benzo(k)fluoranthene	1/14	--	0.022	0.010 - 0.110	0/14	0.22	0/14
Benzo(g,h,i)perylene	1/14	--	0.047	0.010 - 0.070	0/14	NA	NA
Benzo(a)pyrene	1/14	--	0.088	0.002 - 1.3	0/14	0.061	1/14
Bis(2-ethylhexyl)phthalate	1/14	--	2.1	NA	NA	50	0/14
Butylbenzylphthalate	2/14	0.025	0.260	NA	NA	20,000	0/14
Chrysene	3/14	0.040	0.050	0.038	3/14	NA	NA
Dibenz(a,h)anthracene	1/14	--	0.044	NA	NA	0.014	1/14
Fluoranthene	3/14	0.042	0.185	0.003 - 0.040	3/14	3,000	0/14
Indeno(1,2,3-cd)pyrene	1/14	--	0.045	0.010 - 0.015	1/14	NA	NA

Key at end of table.

Table 5-6

SUMMARY OF CONTAMINANTS DETECTED IN SURFACE SOIL SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Background Concentrations (mg/kg)[b]	Exceedance Frequency	Benchmark Health Risk Value (mg/kg)[a]	Exceedance Frequency
		Minimum	Maximum				
Phenanthrene	3/14	0.041	0.047	0.030	3/14	NA	NA
Pyrene	4/14	0.049	0.140	0.001 - 0.197	0/14	2,000	

[a] Guidance derived from human direct ingestion pathway (NYSDEC 1991c).

[b] For inorganics, benchmark value is the upper 90th percentile of concentrations in eastern U.S. soils (Shacklette and Boerngen 1984); for PAHs, benchmark value is the background value found in rural soils (ATSDR 1989).

[c] RCRA CMS action level for copper in soil (USEPA 1990).

[d] NYSDEC value was derived from potassium cyanide and is inappropriate for this use.

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Table 5-7

SUMMARY OF CONTAMINANTS DETECTED IN SUBSURFACE SOIL FROM BORINGS

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Value (mg/kg)[b]	Exceedance Frequency	Benchmark Health Risk Value (mg/kg)[a]	Exceedance Frequency
		Minimum	Maximum				
INORGANIC SUBSTANCES							
Aluminum	19/19	5,550	18,100	128,000	0/19	NA	NA
Arsenic	19/19	1.3	17.9	16	3/19	80	0/19
Barium	16/19	43	281	867	0/19	4,000	0/19
Cadmium	2/19	1.3	1.8	NA	NA	80	0/19
Calcium	14/19	1,150	77,550	14,400	1/19	NA	NA
Chromium	19/19	9.3	27.6	112	0/19	80,000	0/19
Cobalt	19/19	14.5	33.2	19.8	18/19	NA	NA
Copper	19/19	7.7	37	48.7	0/19	3,000[c]	0/19
Iron	19/19	14,700	45,200	54,100	0/19	NA	NA
Lead	18/19	6.6	45.3	33	2/19	250	0/19
Magnesium	19/19	3,590	17,100	10,700	1/19	NA	NA
Manganese	19/19	431	1,750	1,450	2/19	20,000	0/19
Mercury	1/19	--	0.12	0.265	0/19	20	0/19
Nickel	19/19	16.9	53.4	38.2	7/19	2,000	0/19
Potassium	17/19	1,340	1,990	23,500	0/19	NA[d]	0/19
Vanadium	18/19	14.2	24.8	140	0/19	600	0/19
Zinc	19/19	56.3	96.5	104	0/19	20,000	0/19

Key at end of table.

Table 5-7

SUMMARY OF CONTAMINANTS DETECTED IN SUBSURFACE SOIL FROM BORINGS

Chemical	Detection Frequency	Range of Detected Concentrations (mg/kg)		Benchmark Value (mg/kg)[b]	Exceedance Frequency	Benchmark Health Risk Value (mg/kg)[a]	Exceedance Frequency
		Minimum	Maximum				
ORGANIC SUBSTANCES							
Volatiles							
total 1,2-Dichloroethene*	2/19	0.061	0.087	NA	NA	800[e]	0/19
Trichloroethene*	2/19	0.013	0.022	NA	NA	64	0/19
Vinyl chloride*	2/19	0.007	0.021	NA	NA	0.36	0/19

* Contaminant of potential concern.

[a] Guidance derived from human direct ingestion pathway (NYSDEC 1991c).
[b] Upper 90th percentile of concentrations in eastern U.S. soils (Shacklette and Boerngen 1984).
[c] RCRA CMS action level for soils (USEPA 1990).
[d] NYSDEC value was derived from potassium cyanide and is inappropriate for this use.
[e] Derived from cis-1,2-dichloroethene.

Key:

NA = Not available.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Table 5-8

SUMMARY OF CONTAMINANTS DETECTED IN GROUNDWATER SAMPLES FROM MONITORING WELLS

Chemical	Detection Frequency	Range of Detected Concentrations (μg/L)		NYSDOH MCL (μg/L)[a]	Exceedance Frequency	NYSDEC Class GA Groundwater Standard (μg/L)[b]	Exceedance Frequency
		Minimum	Maximum				
INORGANIC SUBSTANCES							
Aluminum	19/21	217	42,700	NA	NA	NA	NA
Arsenic	1/21	--	17.8	50 P	0/21	25	0/21
Barium	5/21	208	342	1,000 P	0/21	1,000	0/21
Calcium	21/21	9,160	85,200	NA	NA	NA	NA
Chromium	7/21	5	110	50 P	1/21	50	1/21
Cobalt	1/21	--	102	NA	NA	NA	NA
Copper	2/21	46.2	115	1,000 S	0/21	200	0/21
Iron	20/21	316	110,000	300 S^c	20/21	300^c	20/21
Lead	12/21	1.2	125	50 P	1/21	25	2/21
Magnesium	20/21	5,400	56,000	NA	NA	35,000 G	3/21
Manganese	21/21	16.4	8,530	300 S^c	14/21	300^c	14/21
Potassium	10/21	5,020	38,000	NA	NA	NA	NA
Sodium	20/21	7,450	51,600	NA	NA	2,000	12/21
Vanadium	1/21	--	67.1	NA	NA	NA	NA
Zinc	11/21	24.1	230	5,000 S	0/21	300	0/21

Key at end of table.

Table 5-8

SUMMARY OF CONTAMINANTS DETECTED IN GROUNDWATER SAMPLES FROM MONITORING WELLS

Chemical	Detection Frequency	Range of Detected Concentrations (µg/L)		NYSDOH MCL (µg/L)[a]	Exceedance Frequency	NYSDEC Class GA Groundwater Standard (µg/L)[b]	Exceedance Frequency
		Minimum	Maximum				
ORGANIC SUBSTANCES							
Volatiles							
Acetone	1/21	--	33	50 G	0/21	5	1/21
Chloroethane	1/21	--	4	5	0/21	5	0/21
Chloroform	1/21	--	2	7	0/21	7	0/21
1,1-Dichloroethane*	2/21	6	11	5	2/21	5	2/21
1,1-Dichloroethene*	4/21	3	12	5	3/21	5	3/21
total 1,2-Dichloroethene*	10/21	3	5,600	5	7/21	5	7/21
Ethylbenzene	1/21	--	3	5	0/21	5	0/21
Methylene chloride	1/21	--	4	5	0/21	5	0/21
Toluene*	4/21	2	9	5	3/21	5	3/21
1,1,1-Trichloroethane	2/21	1	4	5	0/21	5	0/21
Trichloroethene*	9/21	1	1,200	5	6/21	5	6/21

Key at end of table.

Table 5-8

SUMMARY OF CONTAMINANTS DETECTED IN GROUNDWATER SAMPLES FROM MONITORING WELLS

Chemical	Detection Frequency	Range of Detected Concentrations (μg/L)		NYSDOH MCL (μg/L)[a]	Exceedance Frequency	NYSDEC Class GA Groundwater Standard (μg/L)[b]	Exceedance Frequency
		Minimum	Maximum				
Vinyl chloride*	6/21	45	2,100	2	6/21	2	6/21

* Contaminant of potential concern.

[a] Maximum Contaminant Level (10 NYCRR 5-1.52).
[b] NYSDEC 1991.
[c] Total concentration of iron and manganese is not to exceed 500 μg/L.

Key:

G = Guidance value (NYSDEC 1991).
NA = Not available.
P = NYSDOH primary contaminant.
S = NYSDOH secondary contaminant.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

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Table 5-9

SUMMARY OF CONTAMINANTS DETECTED IN RESIDENTIAL WELL AND SPRING SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (µg/L)		NYSDOH MCL (µg/L)[a]	Exceedance Frequency	NYSDEC Class GA Groundwater Standard (µg/L)[b]	Exceedance Frequency
		Minimum	Maximum				
INORGANIC SUBSTANCES							
Aluminum	3/7	323	741	NA	NA	NA	NA
Barium	0/7	NA	NA	1,000 P	0/7	1,000	0/7
Calcium	7/7	13,400	44,850	NA	NA	NA	NA
Chromium	1/7	--	11.1	50 P	0/7	50	0/7
Copper	1/7	--	33.8	1,000 S	0/7	200	0/7
Iron	6/7	107	1,300	300 S[c]	5/7	300[c]	5/7
Lead	0/7	NA	NA	50 P	0/7	25	0/7
Magnesium	7/7	6,070	19,600	NA	NA	35,000 G	0/7
Manganese	7/7	17.7	510	300 S[c]	1/7	300[c]	1/7
Mercury	1/8	--	0.46	2 P	0/7	2	0/7
Potassium	0/7	NA	NA	NA	NA	NA	NA
Sodium	6/7	8,200	58,000	NA	NA	20,000	4/7
Zinc	4/7	13.4	338	5,000 S	0/7	300	1/7
Cyanide	1/7	--	19	NA	0/7	100	0/7

Key at end of table.

Table 5-9

SUMMARY OF CONTAMINANTS DETECTED IN RESIDENTIAL WELL AND SPRING SAMPLES

Chemical	Detection Frequency	Range of Detected Concentrations (μg/L)		NYSDOH MCL (μg/L)[a]	Exceedance Frequency	NYSDEC Class GA Groundwater Standard (μg/L)[b]	Exceedance Frequency
		Minimum	Maximum				
ORGANIC SUBSTANCES							
Volatiles							
Trichloroethene*	1/7	--	2.9	5	0/7	5	0/7

* Contaminant of potential concern.

[a] Maximum Contaminant Level (10 NYCRR 5-1.52).
[b] NYSDEC 1991.
[c] Total concentration of iron and manganese is not to exceed 500 μg/L.

Key:

G = Guidance value (NYSDEC 1991).
NA = Not available.
P = NYSDOH primary contaminant.
S = NYSDOH secondary contaminant.

Source: Compiled by Ecology and Environment Engineering, P.C. 1992.

Table 5-10

CHEMICALS OF POTENTIAL CONCERN

1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene
Toluene
Trichloroethene
Vinyl chloride

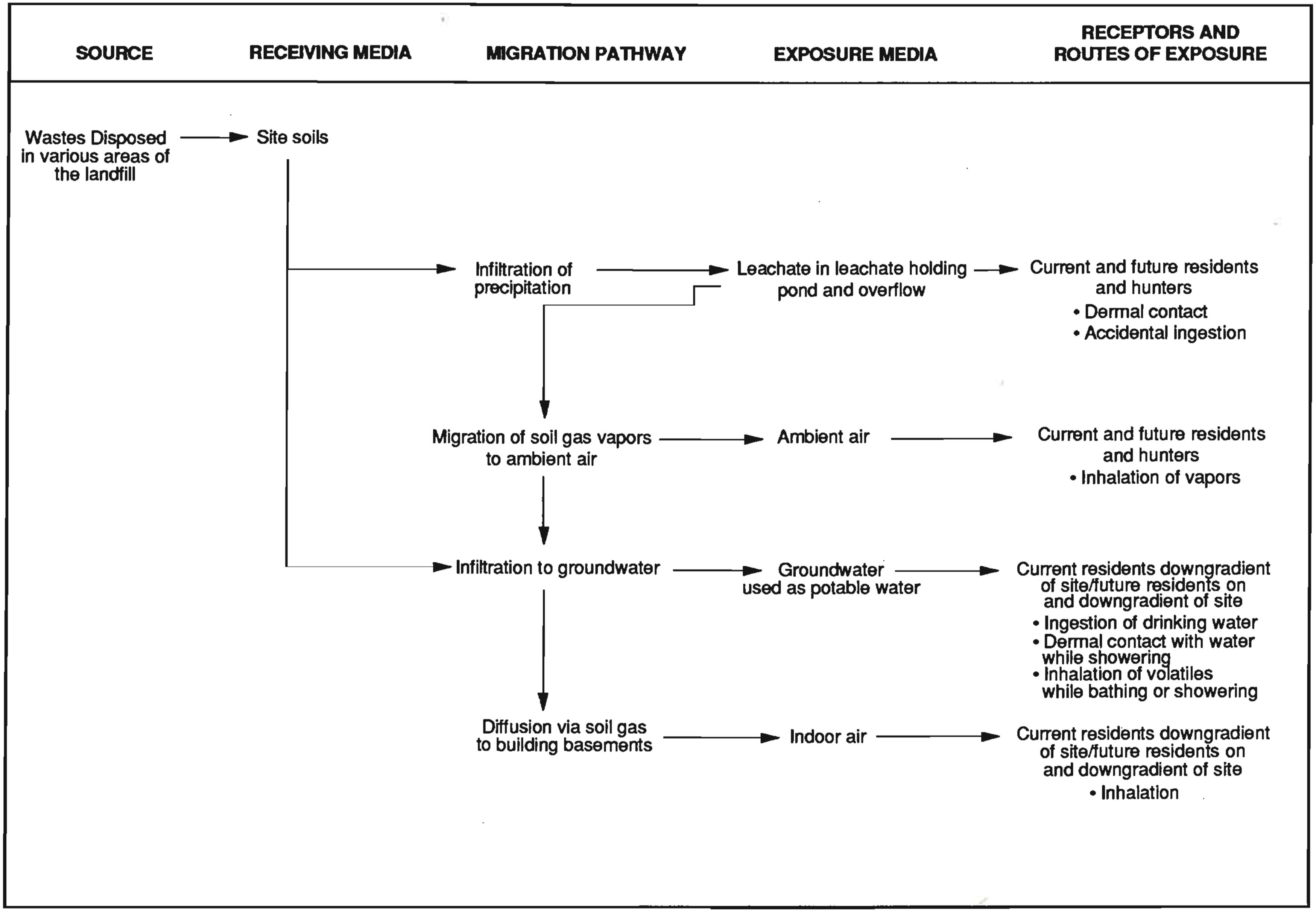

Figure 5-1
CONCEPTUAL SITE MODEL FOR WELLSVILLE-ANDOVER LANDFILL

OB30CSM
MP 3/9

6. HABITAT-BASED ECOLOGICAL ASSESSMENT

The purpose of this habitat-based ecological assessment (HBA) was to identify, map, and describe the upland, wetland, and aquatic ecosystems that occur within the vicinity of the Wellsville-Andover Landfill site. A major objective of the ecological characterization was to determine whether or not significant resources that could be impacted by site contaminants are present within the vicinity of this landfill. These significant resources include jurisdictional wetlands and other sensitive environments; federal or state endangered, threatened, or rare species; and economically or recreationally important fisheries or wildlife. Observations of physically stressed plants and animals that may indicate the effects of landfill site contaminants are also discussed in this section. The scope of work performed during the first phase of the RI addressed items in Step I of Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC 1991).

6.1 REGIONAL ECOLOGY

6.1.1 Aquatic Ecosystems

The Wellsville-Andover Landfill site is located in the Genesee River drainage basin, which is in the south Lake Ontario subbasin of the Great Lakes basin of New York State (United States Geological Survey [USGS] 1985). The Genesee basin is a long and narrow valley that extends southward into Pennsylvania and is characterized by fairly short tributaries flowing into the main stem. Water bodies of interest for this investigation include Duffy Creek, which is approximately 1,500 feet east of the site, and an unnamed tributary to Duffy Creek which is approximately 3,000 feet southeast of the site (see Figure 6-1). Duffy Creek converges with Dyke Creek approximately 1.8 miles south-southeast of the site, then flows southwest for approximately 4 miles, where it converges with the Genesee River.

NYSDEC has designated many water bodies in the Genesee River drainage basin as Class B. Class B waters are to be maintained as suitable habitat for fish and other aquatic life as well as for primary and secondary contact recreation. Class B streams cannot be used as a source of drinking water. Some water bodies within this watershed are designated Class A, which indicates that the water may be used as a public water supply, while some are designated Class C, indicating that the waters are suitable for fishing and fish propagation as well as secondary contact recreation but not primary contact recreation.

Duffy Creek and its tributaries are designated Class C (6 NYCRR 821.6). Dyke Creek is designated Class C between the Village of Andover and the Genesee River. In addition to Class C standards, trout water standards apply to Dyke Creek from 1 mile above its mouth to Andover. Trout standards indicate a cold-water stream. According to a 1990 report by NYSDEC's Division of Water, Dyke Creek downstream of Andover is considered Class C partially due to impairment from failing septic systems. The Genesee River is designated Class C from the mouth of Dyke Creek downstream to the dam at Belmont, New York, which is more than 10 miles from the site. Immediately upstream of Dyke Creek, the Genesee is designated Class A due to the presence of Village of Wellsville water intakes.

6.1.2 Terrestrial Ecosystems

The Wellsville-Andover Landfill is located within beech-maple forest cover types (Eyre 1980). A variety of plant communities occur in the vicinity of the site. The chief determinants of the existing plant communities are topography, soils, moisture, and land use. Since the terrain and land use history at the site are diverse, the associated plant communities are also quite diverse. Hence, the vegetative cover is a mosaic of early successional fields, hedge rows, early successional forests, and mature beech-maple forests. The area surrounding the landfill is a relatively high-quality area due to the terrain, lack of development, and large tracts of unbroken forest on relatively steep hills.

The landfill and surrounding area appears to support an abundance and diversity of animal life. Food sources including seeds, fruits, and browse are available in abundance. Year-round cover is available from the mature forests. Mature forests also provide den trees and raptor nest trees. Water is available in ample supply from streams and ponds.

6.2 ECOLOGICAL CHARACTERIZATION

The HBA of the Wellsville-Andover landfill was conducted using methodologies established in <u>Fish and Wildlife Impact Analyses for Inactive Hazardous Waste Sites</u> (NYSDEC 1991). This involved using information obtained from a site survey, government agency contacts, and literature and map resources to characterize the site. HBAs are a three-step process; however, only step 1 was required by NYSDEC at this time. Step 1, "Site Description," consists of (a) Site Maps, (b) Description of Fish and Wildlife Resources, (c) Value of Fish and Wildlife Resources, and (d) Applicable Fish and Wildlife Regulatory Criteria.

Prior to the initiation of field work, federal and state natural resource agencies were contacted regarding species-of-concern, significant habitats, and fishery resources that are within a 1.5-mile radius of the landfill site.

Literature and map resources were reviewed prior to the initiation of field work. These resources included the USGS Wellsville North topographic quadrangle map, the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Wellsville North quadrangle map, and the Soil Survey of Allegany County (USDA 1956).

E & E conducted a field survey of the site and surrounding areas on October 24, 1991. The findings of this survey are described below in Section 6.3.

6.2.1 Aquatic Ecosystems

A two-member field team surveyed the two streams adjacent to the site on October 24, 1991. Duffy Creek and its unnamed tributary were surveyed in order to characterize their ecological features and to infer their relative quality based on type, number, and diversity of benthic organisms. In addition, some basic water chemistry data were collected. The results of this survey are presented in Section 6.3.

The objective of the survey was to determine if aquatic resources such as biota may be impacted by site-related contaminants. This involved the identification of available habitat in the streams as well as identification of the actual aquatic and benthic species present.

At selected points along the two streams, physical parameters were observed and recorded (see Figure 6-1). These observations included stream location, bank height and composition, stream substratum composition, and flow estimates. In addition, field measurements of temperature, pH, alkalinity, and conductivity were recorded. Temperature, conductivity, and pH were measured using a Cambridge Instruments meter. Alkalinity was measured using a Hach kit. Samples for water hardness were collected and delivered to E & E's ASC for analysis. Stream flow was measured by timing a floating object for a known (measured) distance.

Systematic sampling was conducted to determine type, number, and subsequent diversity of benthic organisms at two locations in Duffy Creek (a perennial tributary to Dyke Creek) and at one location in the intermittent tributary to Duffy Creek. Sampling methods were to include disturbing a known area of the bottom substrate in flowing water and collecting invertebrates swept downstream with a net positioned immediately downstream of the disturbed area. However, conditions in the streams were such that a less quantitative approach was necessitated. Due to the low discharge of the streams, stones were overturned and examined, and leaf debris and woody debris were picked through and examined to determine whether invertebrates were present, and if so, what taxon they belonged to. Because no samples were collected and preserved, identification of benthic macroinvertebrates extend no further than "order."

6.2.2 Terrestrial Ecosystems

The objectives of the terrestrial survey were to map and describe plant communities present on and adjacent to the site, observe wildlife species present in the vicinity of the landfill, identify and evaluate significant ecological resources that could be impacted by site contamination, and note evidence of plant or animal stress that may be a result of site contamination. The results of this survey are presented in Section 6.3.

Vegetative cover-type boundaries were identified and mapped. Each cover type was traversed and described in terms of plant species composition, vegetative structure, edaphic conditions, and land use. Dominant plant species were identified within each strata (i.e., tree sapling, shrubs, liana, and herb). Each vegetative cover type identified was classified according to the New York State Natural Heritage Program's Ecological Communities of New York State (Reschke 1990).

Wetlands were delineated using procedures described in the Corps of Engineers Wetland Delineation Manual (Department of the Army 1987). Soil, vegetation, and hydrology were sampled at suspected wetland areas. Wetland function and value was assessed for each wetland.

Wildlife use was evaluated using literature sources as well as field observations. Species lists were generated by reviewing literature for relatively common species that occur within Allegany County, New York. These species lists were augmented by wildlife sightings made during the field survey. Wildlife sightings included direct observations as well as identification based on vocalizations, tracks, burrows, browse, and scat. General wildlife values (i.e., food and cover availability) of each cover type were also noted.

Evidence of physical stress to flora and fauna observed during the field survey was noted. Areas that exhibited evidence of stress were studied closely for indications of whether or not the stress may have been caused by site contaminants.

6.3 HABITAT-BASED ASSESSMENT

6.3.1 Aquatic Ecosystems

As shown on Figure 6-1, one stream sampling station in Duffy Creek was located upgradient of the landfill (according to USGS topographic maps). This sampling location is still adjacent to the site but near an area that was not used for landfilling purposes. Therefore, this area is assumed to be upstream of any impact from the site. The other two sampling stations were located downgradient of the landfill drainage. Stream widths and depths at all locations were all indicative of first-order streams.

Results of water chemistry analyses are found in Table 6-1. Results of the benthic macroinvertebrate survey are given in Table 6-2. The locations of the sampling points on the streams are shown on Figure 6-1.

Site 1 (Duffy Creek - Upstream)

The upstream sampling site (labeled Site 1) in Duffy Creek has a substratum composed of 60% cobble, 30% boulder, and 10% silt/pebble. Pooled areas contained primarily silt and leaf debris.

At Site 1, the east bank is 10 feet high, 3 feet from shore. Bank has exposed roots covered with moss. Riparian vegetation consisted of a mature American beech *(Fagus grandifolia)* and hemlock *(Tsuga canadensis)* forest. Many sawtimber-sized trees are present, and the understory has a sparse herbaceous cover. The reproductive layer consists of beech, sugar maple *(Acer saccharum)*, and hemlock interspersed with white ash *(Fraxinus americana)*. The west bank was 15 feet high, 10 feet from shore. Some herbaceous cover was present on the bank, and pole size ironwood *(Carpinus caroliniana)*, white ash, and beech were present. Sapling-sized maples were also present.

Stream depth at Site 1 was less than 1 inch in the deepest areas. Flow was negligible, which correlates with the USGS topographic map showing the stream as intermittent at this point. Stream width was 2 to 3 feet, with the majority of this area outside of the main channel.

Water chemistry parameters at the upstream site in Duffy Creek are within the expected range of results for a first-order stream for this geographic area at the time of day the parameters were measured. The upstream portion of Duffy Creek is reasonably well buffered, with alkalinity at 80 mg/L as $CaCO_3$. The water here is moderately hard (120 mg/L as $CaCO_3$) (see Table 6-1). The normal range for alkalinity is 20 to 200 mg $CaCO3_3$ per liter (Lind 1979). According to the classification of Brown, Skougstad, and Fishman (1970), hardness is classified as follows: 0 to 60 mg/L $CaCO_3$ is soft, 61 to 120 mg/L $CaCO_3$ is moderately hard, 121 to 180 mg/L $CaCO_3$ is hard, and 181 mg/L $CaCO_3$ and above is very hard. At 1130 hours, pH was 6.87; the normal diel range for pH in this geographic location is 6.0 to 9.0 (Cole 1979). Both streams in question are Class C (6 NYCRR 821.6). No standards are given for any of the parameters measured, except pH. According to 6 NYCRR 701.19, pH shall be between 6.5 and 8.5, and this water body meets the standard.

Invertebrates collected at the upstream site consisted of a single order of insect larvae, caddisflies *(Trichoptera)*. All individuals were found on the bottom of cobble and boulders; no individuals of any taxon were observed in leaf litter, sand, or woody debris. A monotypic assemblage such as this is often indicative of a stressed system. The probable major stress on this stream system is its intermittent nature.

Site 2 (Duffy Creek - Downstream)

The downstream sampling site in Duffy Creek, labeled Site 2, has a stream substratum composed of 70% cobble, 5% boulder, 15% pebble, and 10% silt. At Site 2, the east bank is

2 feet high, 25 feet from shore. Bank vegetation was mostly herbaceous until the first bank shelf. There, pole-sized quaking aspen *(Populus tremuloides)*, black cherry *(Prunus serotina)*, and ironwood are present. The understory is sparsely populated with raspberry *(Rubus ssp.)*. The second bank shelf has an upland pole-sized forest dominated by beech with occasional ironwood and black cherry. The understory is open, with sensitive ferns *(Onoclea sensibilis)* and sapling beech trees present. The west bank was 10 feet high, 5 feet from shore. This bank is eroded, with sparse herbaceous vegetation and exposed roots. The top of the west bank adjacent to the roadway is a late successional field containing willow *(Salix spp.)*, shrubs, raspberry, sapling- to pole-sized black cherry, sapling-sized ironwood trees, and apple trees *(Malus spp)*.

Stream depth at the downstream site was 1 inch in riffle areas and 8 to 12 inches in pooled areas. Flow was measured as 0.66 feet per second. Stream width ranged from 6 to 8 feet.

Water chemistry results are given in Table 6-1; results fall within the expected range of results for a first-order stream for this geographic area. The downstream portion of this stream had hardness of 76 mg/L as $CaCO_3$, a moderately hard stream. The system is reasonably well buffered, with alkalinity of 60 mg/L as $CaCO_3$. This tributary is Class C according to 6 NYCRR 821.6. No standards for which data was collected were exceeded.

Invertebrates collected at the downstream site area are listed in Table 6-2. Six orders of insects were represented by nine individuals. The taxa present are generally indicative of average-to-good water quality. Mayflies *(Ephemeroptera)* and stoneflies *(Plecoptera)* generally require well-oxygenated water, and dobsonflies *(Megaloptera)* are rarely found in areas lacking a healthy riparian vegetation zone. Cranefly larvae *(Tipulidae)* are generally found in areas high in organic material because these invertebrates are generally detrital feeders (shredders). Numbers of individuals are low, but this may be related to a lack of available habitat.

In the pooled area, several fish were observed, including two sculpins and three minnows.

Site 3 (Tributary to Duffy Creek)

This stream (Site 3) had a substratum of cobbles, boulders, and leaf litter. The stream meanders, and very little water was present.

Bank morphology was variable at Site 3; some banks were high and steep, and others were low. Banks had exposed roots. Riparian vegetation included large red oak *(Quercus rubra)* and large sugar maple, pole-sized white ash, beech, hop hornbeam *(Ostrya virginiana)*, and ironwood. A sparse understory consisted of raspberry and sapling beech trees.

Stream depth at Site 3 was approximately 1 inch, and water was found only in small pools. Flow was negligible. This correlates with the USGS topographic map, which indicates that the stream is intermittent. Stream width was 2 feet.

Water chemistry parameters are within the expected range of results for a first order stream in this geographical area, with alkalinity at 60 mg/L as $CaCO_3$, and pH 6.96 at 1315 hours. No NYSDEC water quality standards were exceeded for any parameter measured in this stream (see Table 6-1).

The benthic macroinvertebrate population in this stream at the locus sampled was not heavily colonized by invertebrates: only two taxa were present, represented by only three individuals. The species found here are species commonly found in small first-order streams as well as ephemeral ponds. Lack of high diversity here is likely a reflection on the transient, intermittent nature of the water body.

Other Aquatic Resources On Site

The drainage collection pond (Pond 1) is a variable-sized pond with a total area of approximately 0.01 acre (see Figure 6-1). This pond is bounded by an early successional stage field and has an emergent wetland containing broadleaf cattails *(Typha latifolia)*, sedges *(Carex spp.)*, and rushes *(Juncus spp.)*. Pond 1 collects surface runoff from the north end of the site. Green frogs were observed in the littoral zone of the pond.

Pond 2, the leachate holding pond, also contains variable amounts of water and encompasses 0.006 acre. This pond is bounded by an early successional field. The pond has no visible submerged or emergent macrophytes. Water in this pond is a rust-orange color and a rust-colored film covered the southern 25% of the pond during the survey. The presence and size of this film was noted to vary. Grass bordering the pond was coated with this red material. This pond collects excess leachate from all areas of the site. Frogs were observed in this water.

6.3.2 Terrestrial Ecosystems

A total of 11 distinct vegetation plant communities were identified within the vicinity of the landfill. The boundaries between these cover types are depicted in Figure 6-2. Dominant plant species identified within the landfill site are listed in Table 6-3. Mammals, birds, and herptiles that were observed during the field surveys or which are likely to occur in the area are listed in Tables 6-4, 6-5, and 6-6, respectively.

Each plant cover type present within the landfill site is described below in terms of plant species composition, vegetation structure, edaphic conditions, and land use. Whenever possible, these areas were classified according to the New York State Natural Heritage Program's <u>Ecological Communities of New York State</u> (Reschke 1990).

Cover Type 1A: Beech-Maple Mesic Forest

This area is located along the western boundary of the landfill. American beech and sugar maple are codominants in this 60- to 70-foot tall overstory. The understory is fairly sparse and open with sapling beech trees and various raspberry shrubs *(Rubus spp.)*. The ground is predominantly covered with leaf litter, with little herbaceous growth except for a few Christmas ferns *(Polytichum acrostichoides)*.

This cover type is rather large and appears to extend well west of the area surveyed. This forest occurs on a hillside with a slope ranging between 20% and 40%. This cover type provides benefits to a variety of animals because many wildlife species include the seeds, bark, and leaves in their diet. In addition, the trees provide nesting and roosting areas for songbirds and gamebirds, as well as valuable cover for whitetail deer *(Odocoileus virginianus)*, eastern gray squirrel *(Sciurus cardinensis)*, and eastern chipmunk *(Tamias striatus)* (Martin et al. 1961).

Cover Type 1B: Beech-Maple Mesic Forest

This pole-sized forest, dominated by beech and sugar maple, is an island surrounded by grassy field. A minor component of the canopy is quaking aspen. The understory consisted of beech saplings. There was no ground cover at the time of survey.

This forest is basically similar in structure and species composition to Cover Type 1A. Therefore, the value of this community to wildlife is expected to be basically similar to that of Cover Type 1A. The size of the island is a factor limiting the size population that it may support.

Cover Type 1C: Beech-Maple Early Successional Forest

This cover type is dominated by beech trees and saplings, and sugar maple and quaking aspen saplings. It has a thick shrub layer consisting of staghorn sumac *(Rhus typhina)* and raspberries. A dense herbaceous layer is present at the edge of this area and is dominated by grasses and goldenrod. The leachate collection system runs through this area.

Sumacs do not provide choice or preferred food for wildlife; however, they are an important winter food for upland gamebirds such as ruffed grouse and wild turkey. Songbirds such as the cardinal *(Cardinalis cardinalis)* and robin also utilize Sumac fruit, and whitetail deer feed on the twigs and fruit (Martin et al. 1961). This area also provides cover for those wildlife species using the grassy fields.

Cover Type 2: Red Oak-Maple Forest

Cover Type 2 consists of a pole- to sawtimber-sized forest dominated by sugar maple and red oak. Minor components of the canopy include ironwood, white ash, and pin cherry

(Prunus pensylvanica). There was a dense reproductive/shrub area dominated by beech and maple sapling and wild raisin. The ground was covered with ferns.

This cover type is rather large and appears to extend well north and east of the area surveyed for this ecological characterization. Numerous snag trees are present.

The abundance of red oak results in a high-quality wildlife area. Oak acorns are valuable fall and winter wildlife foods. Upland game birds such as ruffed grouse *(Bonasa umbellus)* and wild turkey *(Meleagris gallopavo)* feed heavily upon acorns in season. A few songbirds, including the blue jay *(Cyanocitta cristata)* and northern flicker *(Colaptes avratus)*, feed on acorns. Acorns are also important food items in the diets of several rodents, including the northern flying squirrel *(Glaucomys sabrinus)*, eastern gray squirrel, and chipmunks. White-tail deer and black bear *(Ursus americanus)* also feed heavily upon acorns during fall and winter months (Martin et al. 1961).

The snag trees provide nesting cavities for wildlife species such as the barred owl *(Strix varia)* and downy woodpecker *(Picoides pubescens)*. These snags, as well as the saplings and shrubs for deer browse and late summer fruit, contribute to habitat quality.

Cover Type 3: Quaking Aspen Early Successional Forest

This cover type is an approximately 25-foot woodland area bordering a drainage ditch. At the time of survey, no water was present in the ditch. This area consists of a few large red oak and hemlock trees interspersed with pole-sized quaking aspen. The reproductive layer was dense and consisted of sugar maple, white ash, ironwood, and hop hornbeam. The herbaceous layer was sparse and dominated by goldenrods.

The relatively dense sapling growth adjacent to the grassy landfill is a valuable source of cover for animals that use the grassy field.

Cover Type 4: Grassy Field

Cover Type 4 is the most prevalent cover type found within the boundaries of the landfill. The dominant species included goldenrod *(Solidago spp.)* and panic grass *(Panicum sp.)*. Other herbs that occur in lesser abundance include Queen Anne's Lace *(Daucus carota)*, yarrow *(Achillea millefolium)*, teasel *(Dipsacus sylvestris)*, and red clover *(Trifolium pratense)*. Saplings and shrubs such as quaking aspen and wild raisin *(Viburnum cassinoides)* are sparse and beginning to invade this field.

This grassy field area serves as a small opening that provides edge and food. Panic grass produces seed that is eaten by songbirds such as the song sparrow *(Melospiza melodia)*, field sparrow *(Spizella pusilla)*, and rufous-sided towhee *(Pipilio erythrophthalmus)*. The wild raisin produces fruit that is important in the diets of a variety of songbirds, such as the American robin *(Turdus migratorius)*. These shrubs also provide browse for whitetail deer and eastern cottontail *(Sylvilagus floridanus)* (Martin et al. 1961). The sparse nature of these shrubs will not support a large population of fruit-eating species.

Cover Type 5: Wetland 1

This cover type is a herbaceous wet area dominated by cattail and reed grass *(Phragmites communis)*. A soil test pit revealed an impervious clay layer approximately 6 inches below ground surface that had water flowing on it.

This area meets the hydrophytic vegetation and wetland criteria of the U.S. Army Corps of Engineers wetland delineation process (Department of the Army 1987). Soils were not sampled; however, the hydric soil criterion is assumed to be met based on the presence of hydrophytic vegetation and wetland hydrology. This area therefore is classified as a jurisdictional palustrine emergent wetland.

Due to the small size of this wetland area, its value for wildlife is limited. Wildlife species from the surrounding area may forage at this area.

Cover Type 6: Hedgerow

This cover type is composed of a single row of trees and shrubs that border the eastern edge of the landfill. These trees are pole-sized white ash, quaking aspen, sugar maple, red oak, and hemlock.

The quality and size of this area make it markedly poor habitat for wildlife species.

Cover Type 7: Mowed Lawn

This cover type is dominated by clipped grasses. It is located around the Wellsville Area Small Plane Society Airfield located north of the site. Characteristic birds of these areas include robin, killdeer *(Charadrius vociferus)*, and starling *(Sturnus vulgaris)*. Otherwise, this area is a low-quality wildlife habitat.

Cover Type 8: Borrow Field

The soil from this area was removed and used for cover in the fill areas. This area is barren, with a sparse herbaceous covering.

Due to the barren nature of this area, it is a low-quality wildlife habitat.

Cover Type 9: Drainage Collection Pond

This area contains a pond that collects surface runoff from the north end of the site. Surrounding this pond is emergent wetland vegetation. This includes broad-leaf cattail, sedges, and rushes.

This area meets the hydrophytic vegetation and wetland hydrology criteria of the U.S. Army Corps of Engineers wetland designation process (Department of the Army 1987). Soils were not sampled; however, the hydric soil criterion is assumed to be met based on the presence of hydrophytic vegetation and wetland hydrology. This pond area is therefore classified as a jurisdictional wetland.

Due to the small size of this wetland area, its value for wildlife is limited. Amphibians such as the green frog *(Rana clamitans)* and bull frog *(Rana catesbeiana)* may use the pond for breeding. Wildlife species from the surrounding area may forage and drink water from this pond.

Cover Type 10: Leachate Overflow Collection Pond

This area collects excess red leachate from the on-site pump house. The grasses surrounding the pond are coated with the leachate. The pond itself is void of any vegetation.

This pond is a low-quality wildlife habitat. A few amphibians such as green and bull frogs may use this area for breeding in the spring.

Cover Type 11: Hemlock-Northern Hardwood Forest

Cover Type 11 consists of pole- to sawtimber-sized forest dominated by hemlock, with beech and sugar maple present. This forest type is found on the middle to lower slopes of ravines. The understory is fairly sparse, with hemlock, beech, and sugar maple saplings. The understory was sparse with a few ferns scattered. This cover type appears to extend for some distance east of the site.

This cover type provides benefits to a variety of animals, such as those described for Cover Type 1A. Also, the dense covering of hemlock provides excellent deer wintering areas. Hemlock provides food and shelter through the winter months.

Table 6-1

STREAM WATER CHEMISTRY
OCTOBER 24, 1991

Sampling Station	Temperature (°F)	pH (s.u.)	Alkalinity (mg/L as $CaCO_3$)	Specific Conductance (µS/cm)	Hardness (mg/L as $CaCO_3$)	Time of Readings
Site 1	57	6.87	80	335	120	
Site 2	59	6.99	60	259	76	
Site 3	61.5	6.96	60	171	NA	

NA = Water not present in sufficient quantity to sample without disturbing sediment.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 6-2

AQUATIC BIOTA (INVERTEBRATES) ENCOUNTERED DURING STREAM SURVEY OCTOBER 24, 1991

Sampling Station	Taxon (order)	Common Name	Number of Individuals
Site 1	*Trichoptera*	Caddisfly	15
Site 2	*Diptera*[a]	Cranefly	3
	Trichoptera	Caddisfly	1
	Megaloptera[b]	Dobsonfly	1
	Ephemeroptera	Mayfly	1
	Plecoptera	Stonefly	2
	Hemiptera[c]	Water strider	1
Site 3	*Gastropoda*[d]	Snail	4
	Oligochaeta[d]	Aquatic earthworm	1

[a] *Tipulidae*.

[b] *Corydalus cornutus*.

[c] *Gerridae*.

[d] Class.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 6-3

PLANT SPECIES IDENTIFIED AT THE WELLSVILLE-ANDOVER LANDFILL

Common Name	Scientific Name
Black Cherry	*Prunus serotina*
Blackberry	*Rubus allegheniensis*
Willow	*Salix spp.*
Ironwood	*Carpinus caroliniana*
Quaking aspen	*Populus tremuloides*
Beech	*Fagus grandifolia*
White ash	*Fraxinus americana*
Sugar maple	*Acer saccharum*
Hemlock	*Tsuga canadensis*
Grasses	*Poa spp.*
Small white aster	*Aster vimineus*
Goldenrod	*Solidago spp.*
Queen Anne's lace	*Daucus carota*
Yarrow	*Achillea millefolium*
Teasel	*Dipsacus sylvestris*
Daisy fleabone	*Erigeron annuus*
Alsike clover	*Trifolium hybridum*
Red oak	*Quercus rubra*
Broadleaf cattail	*Typha latifolia*
Sedges	*Carex spp.*
Rushes	*Juncus spp.*
Hop hornbeam	*Ostrya virginiana*
Staghorn sumac	*Rhus typhina*
Pin cherry	*Prunus pensylvanica*
Wild raisin	*Viburnum cassinoides*
Arrowwood	*Viburnum recognitum*
Wild strawberry	*Fragaria virginiana*
Sensitive fern	*Onoclea sensibilis*

Table 6-3

PLANT SPECIES IDENTIFIED AT THE WELLSVILLE-ANDOVER LANDFILL

Common Name	Scientific Name
Black raspberry	*Rubus phoenicolasius*
Christmas fern	*Polytichum aerostichoides*

Note: During the survey, it was difficult to identify herbaceous vegetation because of a killing frost that caused it to die off.

Source: Ecology and Environment Engineering, P.C. 1991.

Table 6-4

REPTILES AND AMPHIBIANS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Snapping turtle (common)	*Chelydra serpentina*
Wood turtle	*Clemmys insculpta*
Spotted turtle	*Clemmys guttata*
Stinkpot	*Sternotherus odoratus*
Midland painted turtle	*Chrysemys picta*
Eastern garter snake	*Thamnophis sirtalis sirtalis*
Northern red-bellied snake	*Storeria occipitomaculata*
Northern brown snake	*Storeria dekayi dekayi*
Northern ringneck snake	*Diadophis punctatus*
Eastern green snake	*Opheodrys vernalis*
Northern black racer	*Coluber constrictor*
Black rat snake	*Elaphe obsoleta*
Eastern milk snake	*Lampropeltis triangulum*
Red-spotted newt	*Notophthalmus viridescens*
Jefferson salamander	*Ambystoma jeffersonianum*
Spotted salamander	*Ambystoma maculatam*
Mountain dusky salamander	*Desmognathus ochrophaeus*
Northern dusky salamander	*Desmognathus fuscus*
Northern spring salamander	*Gyrinophilus porphyriticus*
Slimy salamander	*Plethodon glutinosus*
Red-backed salamander	*Plethodon cinereus*
Four-toed salamander	*Hemidactylium scutatum*
Northern two-lined salamander	*Eurycea bislineata*
Long-tailed salamander	*Eurycea longicauda*
American toad	*Bufo Americanus*
Northern spring peepers	*Hyla crucifer*
Gray treefrogs	*Hyla versicolor and Hyla chrysoscelis*
Green frogs	*Rana clamitans*
Bull frog	*Rana catesbeiana*

Table 6-4

REPTILES AND AMPHIBIANS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Pickerel frog	*Rana palustris*
Wood frog	*Rana sylvatica*

Compiled by Ecology and Environment Engineering, P.C. 1991.

Source: Conot 1975.

Table 6-5

BIRDS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Common barn-owl	*Tyto alba*
Eastern screech-owl	*Otus asio*
Great horned owl	*Bubo virginianus*
Chimney swift	*Chaetura pelagica*
Ruby-throated hummingbird	*Archilochus colubris*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-bellied woodpecker	*Melanerpes carolinus*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Downy woodpecker	*Picoides pubescens*
Hairy woodpecker	*Picoides villosus*
Northern flicker	*Colaptes auratus*
Eastern wood-pewee	*Contopus virens*
Willow fly catcher	*Dmpidonax traillii*
Least fly catcher	*Empidonax minimus*
Eastern phoebe	*Sayornis phoebe*
Great crested flycatcher	*Myiarchus crinitus*
Eastern kingbird	*Tyrannus tyrannus*
Horned lark	*Eremophila alpestris*
Purple martin	*Progne subis*
Tree swallow	*Tachycineta bicolor*
Barn swallow	*Hirundo rustica*
Blue jay	*Cyanocitta cristata*
American crow	*Corvus brachyrhynchos*
Black-capped chickadee	*Parus atricapillus*
Tufted titmouse	*Parus bicolor*
White-breasted nuthatch	*Sitta carolinensis*
Brown creeper	*Certhia americana*
House wren	*Troglodytes aedon*
Sharp-shinned hawk	*Accipiter striatus*

Table 6-5

BIRDS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Cooper's hawk	*Accipiter cooperii*
Northern goshawk	*Accipiter gentilis*
Red-shouldered hawk	*Buteo lineatus*
Broad-winged hawk	*Butes platypterus*
Red-tailed hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Ring-necked pheasant	*Phasianus colchicus*
Ruffed grouse	*Bonasa umbellus*
Wild turkey	*Meleagris gallopavo*
Killdeer	*Charadrius vociferus*
Rock dove (domestic pigeon)	*Columba livia*
Mourning dove	*Zenaida macroura*
Black-billed cuckoo	*Coccyzus erythropthalmus*
Yellow-billed cuckoo	*Coccyzus americanus*
Barred owl	*Strix varia*
Pileated woodpecker	*Dryocopus pileatus*
Northern rough-winged swallow	*Stelgidopterix serripennis*
Bank swallow	*Riparia riparia*
Veery	*Cathaus fuscescerrs*
Northern mockingbird	*Mimus polygottos*
Yellow-throated vireo	*Vireo flavifrons*
Warbling vireo	*Vireo gilvus*
Red-eyed vireo	*Vireo olivaceus*
Blue-winged warbler	*Vermifurma pinus*
Yellow warbler	*Dendroica petechia*
Chestnut-sided warbler	*Dendroica pensylvanica*
Black-throated green warbler	*Dendroica virens*
American red start	*Setophaga raticilla*
Mourning warbler	*Oporornis philadelphia*

Table 6-5

BIRDS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Common yellow throat	*Geothlypis trichas*
Scarlet tanager	*Piraga olivacea*
Northern cardinal	*Cardinalis cardinalis*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Indigo bunting	*Passerina cyanea*
Rufous-sided towhee	*Pipilo erythrophathalmus*
Chipping sparrow	*Spizella passerina*
Field sparrow	*Spizella*
Pusilla	*Savannah sparrow*
Passerculus	*sandwichensis*
Song sparrow	*Melogpiza melodia*
Bobolink	*Dolichonyx oryzivorus*
Red-winged blackbird	*Agelqius phoeniceus*
Eastern meadowlark	*Sturnella magna*
Common grackle	*Quiscalus quiscula*
Brownheaded cowbird	*Molothrus ater*
Northern oriole	*Icterus galbula*
Purple finch	*Carpodacus purpureus*
American goldfinch	*Carduelis tristis*
House sparrow	*Passer domesticus*
Starling	*Sturnus vaqaris*

Compiled by Ecology and Environment Engineering, P.C., 1991.

Source: Andrle and Carrol 1988.

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Table 6-6

MAMMALS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Opossum	*Didelphis marsupialis*
Masked shrew	*Sorex cinereus*
Smoky shrew	*Sorex fumeus*
Longtail shrew	*Sorex dispar*
Pygmy shrew	*Microsorex hoyi*
Least shrew	*Cryptosis parva*
Shorttail shrew	*Blarina brevicauda*
Hairytail mole	*Parascalops breweri*
Keen myotis	*Myotis keeni*
Little brown myotis	*Myotis lucifugus*
Small-footed myotis	*Myotis subulatus*
Silver-haired bat	*Lasionycteris noctivagans*
Eastern pipistrel	*Pipistrellus subflavus*
Big brown bat	*Eptesicus fuscus*
Red bat	*Lasiurus borealis*
Hoary bat	*Lasiurus cinereus*
Raccoon	*Procyon lotor*
Shorttail weasel	*Mustela erminea*
Longtail weasel	*Mustela frenata*
Striped skunk	*Mephitis mephitis*
Red fox	*Vulpes fulva*
Gray fox	*Urocyon cinereoargenteus*
Woodchuck	*Marmota monax*
Black bear	*Ursus americanus*
Eastern chipmunk	*Tamias striatus*
Eastern gray squirrel	*Sciurus carolinensis*
Red squirrel	*Tamiasciurus hudsonicus*
White-footed mouse	*Peromyscus leucopus*
Deer mouse	*Peromyscus maniculatus*

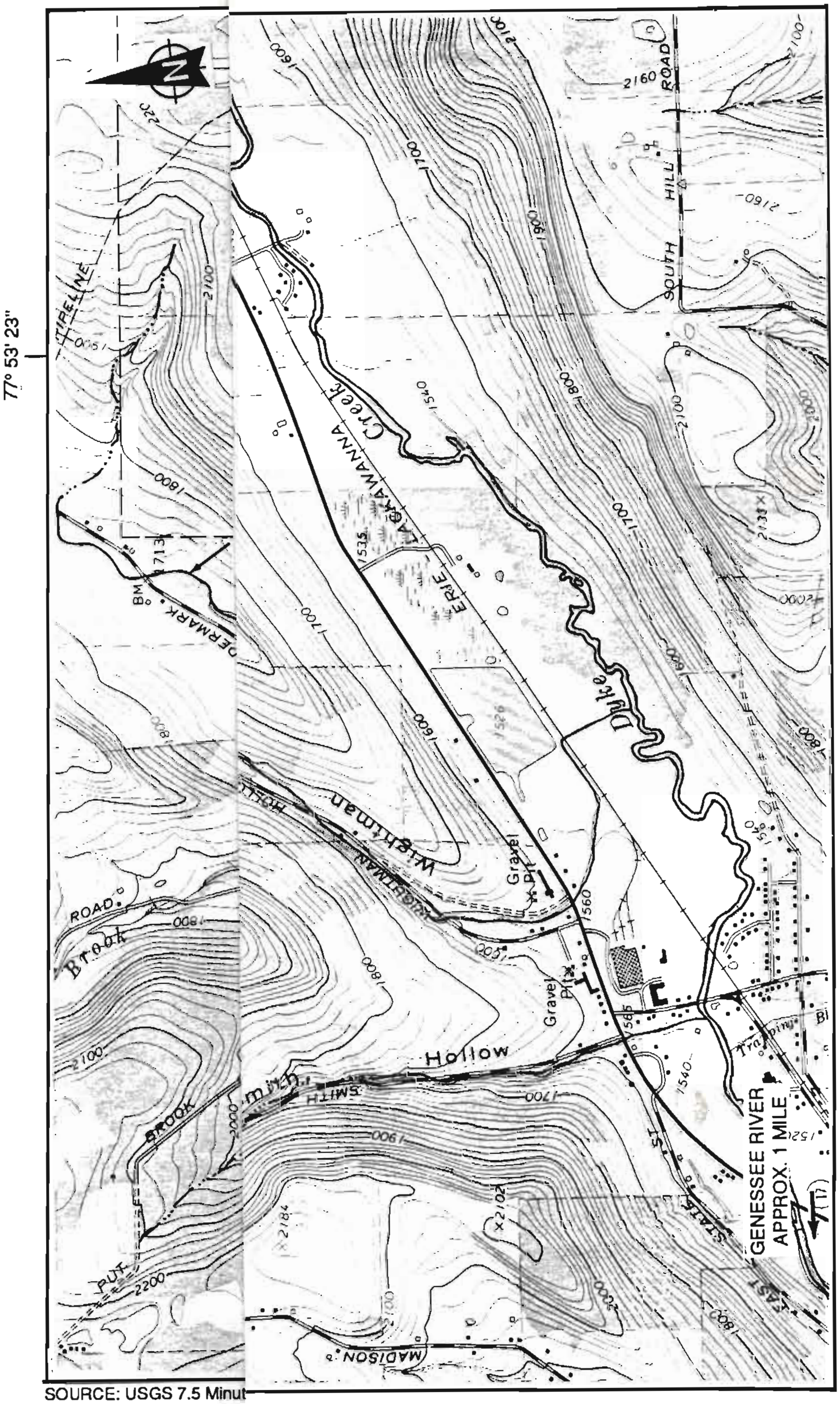
Table 6-6

MAMMALS THAT MAY OCCUR AT THE WELLSVILLE-ANDOVER LANDFILL SITE

Common Name	Scientific Name
Coyote	*Canis latrans*
Boreal redback vole	*Clethrionomys gapperi*
Meadow vole	*Microtus pennsylvanicus*
Pine vole	*Pitymys pinetorum*
Meadow jumping mouse	*Zapus hudsonius*
Southern flying squirrel	*Glaucomys volans*
Northern flying squirrel	*Glaucomys sabrinus*
Eastern cottontail	*Sylvilagus floridanus*
Whitetail deer	*Odocoileus virginianus*

Compiled by Ecology and Environment Engineering, P.C., 1991.

Source: Burt and Grossenheider 1976.



SOURCE: USGS 7.5 Minut

Figure 6-1
SURFACE WATER SITES
SURVEYED DURING
THE OCTOBER 24, 1991 HBA

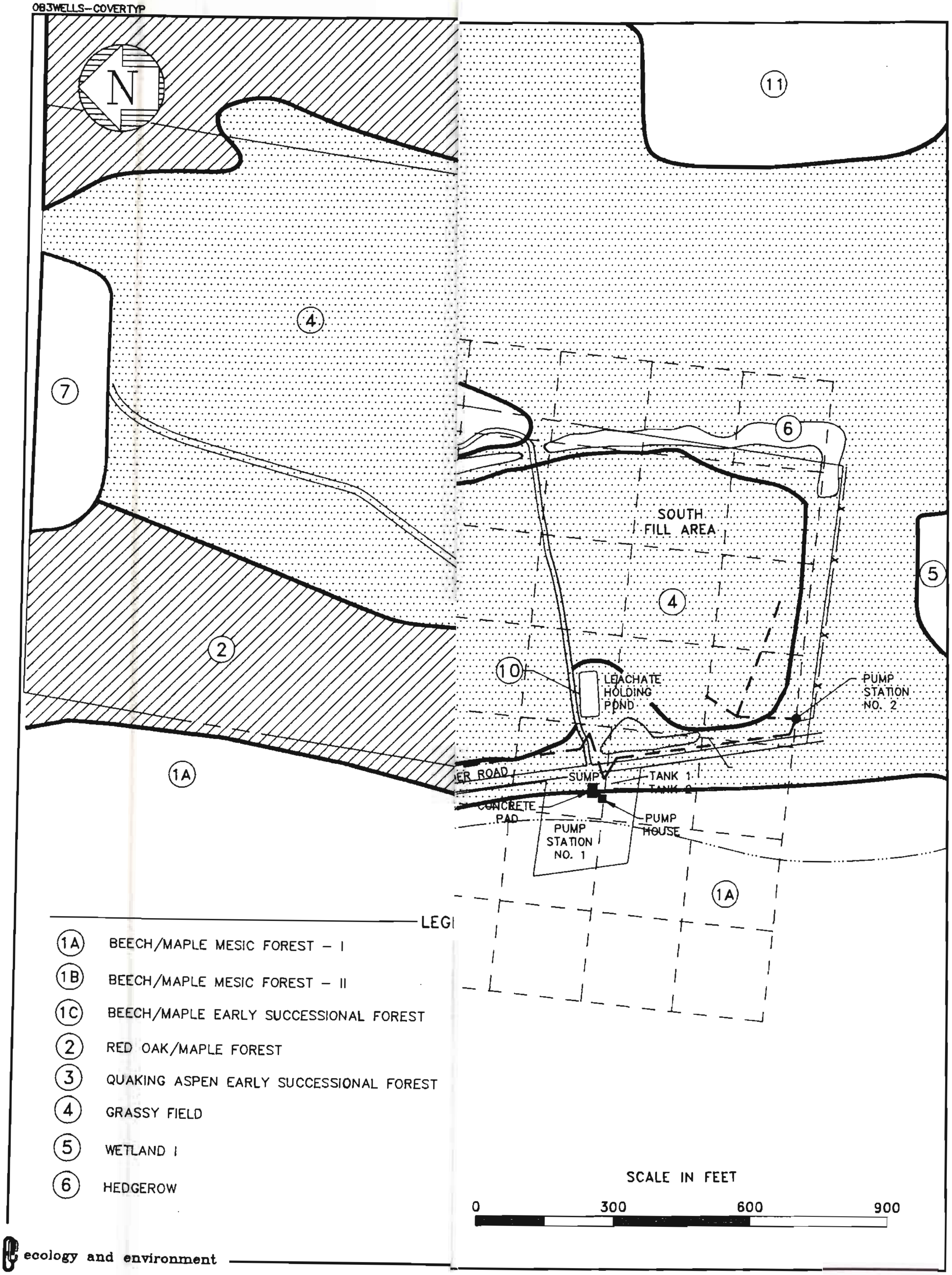


Figure 6-2 COVER – TYPE MAP
WELLSVILLE – ANDOVER LANDFILL

7. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

7.1 SUMMARY

The Phase I RI for the Wellsville-Andover Landfill, Site No. 9-02-004, in the towns of Wellsville and Andover, Allegany County, New York, was performed by E & E under contract to NYSDEC. Site work for the Phase I field activities was performed from August of 1991 through February of 1992. The objectives of the RI/FS are to:

- Assess the cause, extent, and effects of the hazardous materials present in the project area;
- Identify and evaluate remedial alternatives selected to mitigate contamination problems threatening the environment or public health; and
- Recommend remedial alternatives.

Prior to the Phase I RI, a Phase I study was performed for NYSDEC in 1983 by Engineering-Science, Inc. in association with Dames and Moore, and a Phase II study was performed in 1986 by Malcolm Pirnie for the Village of Wellsville. Factors of concern indicated by these studies were contaminated groundwater potentially impacting local residents and the generation of leachate contaminated with VOCs.

During the Phase I RI site characterization, preliminary field activities performed prior to sampling of environmental media included a ground-based survey, the development of a base map, and the performance of three geophysical surveys.

The geophysical investigation included a total earth field magnetics survey, a ground conductivity survey, and a seismic refraction survey. The purposes of the geophysical investigation were to:

- Locate subsurface ferrous objects;
- Define waste-disposal areas;
- Detect potential groundwater contaminant plumes;

- Determine the morphology and stratigraphy of the subsurface; and
- Assist in the selection of monitoring well locations.

The results of this investigation allowed E & E to detect five highly anomalous locations within the fill areas. Each area was excavated and the cause of the anomaly determined. In addition, the boundaries of the four fill areas were identified by the geophysical investigation and depicted on the base map. Waste disposal appears to have been performed in a cellular fashion in the northeast fill area, while in the other areas, filling appears to have occurred in a more haphazard manner. No groundwater contaminant plume was noted outside the fill areas, suggesting that heavy metals have not had a major impact on groundwater. Seismic profiles for the site were generated, depicting subsurface stratigraphy, and these profiles were used to aid in the selection of monitoring well locations.

Steel 55-gallon drums were located in three of the five locations excavated. Of these, an empty, crushed oil drum was located in the south fill area, and five rusted drums were located in the northeast corner of the south-central fill area. These drums contained a solid, plastic-like material and were surrounded by plastic buttons and scraps, presumably from Rochester Button Co. In addition, two rusted, liquid-filled drums with no identifiable markings were discovered in the northwest corner of the northwest fill area. Soil and waste samples collected from these trenches indicate the presence of numerous contaminants, including chlorinated aliphatic compounds (1,2-DCE, TCE, VC, etc.), aromatic hydrocarbons (benzene, ethylbenzene, toluene, xylene, and styrene), PAHs, phthalates, phenols, and pesticides. Sample TP-2 contained relatively low amounts of the above contaminants, except for PAHs, phthalates, and pesticides, which were found at comparatively higher concentrations. The PAHs detected may have resulted from incomplete combustion of waste prior to disposal, while the phthalates most likely resulted from the relatively large amount of plastic in this disposal area compared to other areas. Sample TP-1 from the northwest fill area contained relatively high concentrations of most of the above contaminants, while TP-4 from the south-central fill area contained the highest concentration of total chlorinated aliphatics and phthalates.

When compared to observed ranges in eastern U.S. soils, concentrations of cobalt, lead, and zinc were found to be slightly elevated across the site, while arsenic, copper, and nickel were slightly elevated only in the northwest fill area. Based on available data, the concentrations of these metals suggest that all are fairly ubiquitous in the area.

Subsurface soil samples were collected from each of the deep well borings for chemical analysis. The only organic substances detected were chlorinated aliphatic compounds in the two samples from MW-5D. A total of 130 μg/kg were detected at 8 to 9 feet, and approximately 81 μg/kg were detected at 18 to 19 feet. Several inorganic substances exceeded the 90th percentile of the observed range in eastern U.S. soils, but only lead appears not to be attributable to background conditions.

During the Phase I RI, E & E installed 17 monitoring wells were installed and sampled along with four pre-existing wells. Organic compounds detected in the groundwater samples included several chlorinated aliphatic compounds and the aromatic hydrocarbons ethylbenzene and toluene. The monitoring wells containing these compounds above NYSDEC Class GA standards included MW-2D, MW-5D, MW-5S, MW-6D, MW-11S, CW-3A, and CW-3B. All of these wells are on the east or south side of the site. Concentrations of total chlorinated aliphatic compounds ranged up to a maximum of approximately 8,100 µg/L in GW-5S. Since a component of groundwater flow does exist toward the wells on the west side of the site, the relative lack of contaminants in these wells suggests that the leachate collection system on the west side of the site may be intercepting contaminated groundwater and/or the fractured bedrock has permitted the groundwater to migrate vertically.

Inorganic substances detected above Class GA standards in the groundwater--with the exception of iron, manganese, magnesium, and sodium, which are commonly high in unfiltered samples--were chromium in GW-2D and lead in GW-12S and GW-2D.

Seven residential wells and springs in the area were sampled. The only organic compound detected was TCE, which was found below the Class GA standard in the LaDue spring south-southeast of the site. Inorganic substances above Class GA standards include iron and sodium in more than half the samples, manganese in the Rosini well, and zinc in the Bauer well. All four of these metals are considered secondary contaminants by NYSDOH and appear to be naturally ubiquitous.

Six surface water and sediment samples were collected from Duffy Creek and its unnamed tributary. No organic or inorganic analytes in either medium were found to significantly exceed the concentrations in the background sample.

Twelve biased and two background surface soil samples were collected at the site. Analysis indicated the presence of chloromethane and/or ethylbenzene in samples collected from seeps in the northwest fill area. In addition, several PAHs were detected at various concentrations in leachate seeps and ditches on and off the site. Inorganic substance analyses of these surface soil samples indicated elevated concentrations of calcium, cobalt, iron, lead, manganese, nickel, and zinc; however, all these substances appear to be naturally ubiquitous.

Liquid leachate samples were collected from two locations along the leachate collection system. Inorganic substances exceeding Class C standards in the leachate are aluminum, lead, and zinc in both samples and vanadium only in L-1. Volatile and semivolatile compounds were also detected in these samples; however, the concentrations were significantly less than expected based on air sampling results.

Six air samples were collected at various points along the leachate collection system. Analysis indicated the presence of relatively high concentrations of chlorinated aliphatic compounds and aromatic hydrocarbons. The relatively high concentrations of VOCs in the air samples suggests that the leachate may not be the only source of the VOCs. However, if the leachate collection system were receiving vapors directly from the landfill, then VOCs should have been detected in subsurface soil samples collected near fill areas.

Air sampling results indicated that the majority of the VOCs in the collection system are emanating from the northwest fill area. Samples collected from manholes MH-6 and MH-10 and Riser R-10 contained one to two orders of magnitude more VOCs than the other samples analyzed. Air monitoring results support this.

In addition to the above site characterization, a habitat-based ecological assessment was performed at the site to characterize the ecological resources associated with this site. The scope of work performed addressed items only in Step 1 of Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC 1991). A background search and a field reconnaissance were performed to characterize both the terrestrial and aquatic ecosystems at the site. Site-related flora and fauna were identified, with emphasis on sensitive receptors. In addition, a cover-type map of the site was generated.

7.2 CONCLUSIONS AND RECOMMENDATIONS

The Phase I RI has identified several contaminants of concern that occur in significant concentrations at the Wellsville-Andover Landfill site. As identified by the preliminary risk evaluation, the most significant contaminants of potential concern are 1,1-DCA; 1,1-DCE; 1,2-DCE; toluene; TCE; and VC. These contaminants were detected at elevated concentrations in a variety of media, including subsurface soil and waste, surface soil, groundwater, leachate, and air.

These contaminants are migrating off site to an unknown extent in the groundwater. The extent of migration of contaminants in both the leachate and surface water has also not been fully characterized. In addition, no ambient air samples were collected over a prolonged period. Ambient air quality is of concern due to the known presence of VOCs in all media sampled and their potential to migrate off site.

The data suggest that perched water occurs sporadically in the area of the site. Below the perched water, fractured bedrock may provide a pathway for groundwater to migrate vertically and eventually travel off site. Due to a lack of subsurface information, the significance of vertical migration and the interplay between the perched water and the lower aquifer cannot be assessed.

In order to fully assess the impact of the site-related contaminants on human health and the environment and provide further information for the selection of remedial alternatives, a Phase II RI is recommended.

E & E proposes the following as a general course of action for the additional investigation. It is noted that the Phase I FS is in progress at the time of this report, and, therefore, the site activities recommended as follows may be altered to accommodate the findings of the FS. Comments supplied by NYSDEC may also affect these recommendations.

- In order to further define the horizontal extent of groundwater contamination and further characterize the local hydrogeology, the installation of a minimum of five off-site groundwater monitoring well pairs is recommended. This includes wells south of MW-11S and east of MW-2D/2S, MW-5D/5S, and MW-6D/6S, as well as the installation of a monitoring well pair east of the northeast fill area.

- The depth to competent (confining) bedrock and the degree of vertical contamination should be investigated. E & E suggests that at least one deep monitoring well be drilled in an area of contamination (e.g., near MW-5D/5S). A field gas chromatograph or other means may be utilized during drilling to investigate contamination.

- Installation of additional on-site wells should be considered in areas conducive to drilling in order to supplement data collected for each fill area.

- The installation of approximately 12 shallow well points (piezometers) in the fill areas is recommended to investigate the interaction of groundwater and the fill and provide more detailed information pertaining to on-site hydrogeology.

- In order to characterize site groundwater hydrogeology and aid in the determination of the quantity of groundwater permeating the site, slug tests should be performed in 10 to 12 of the existing and proposed monitoring wells.

- A limited soil gas survey performed on the west side of the site adjacent to a fill area may provide information about the effectiveness of the leachate collection system. Further limited soil gas surveys in selected areas on and off site on the east and south sides of the site, especially near MW-2D/2S, MW-5D/5S, MW-6D/6S, and MW-11S, would aid in the selection of the monitoring well locations discussed above. These data will also provide information pertaining to the potential migratory pathway of VOCs in soil and may provide a rough estimate of the quantities of VOCs that could permeate surrounding areas if the site were provided with an impermeable cap.

- To further investigate the migratory pathways of VOCs and to further assess their impact on human health and the environment, E & E proposes to collect leachate samples for full TCL analysis from approximately four locations. Leachate samples should be collected from both the north and south ends of the collection system to evaluate volatilization along the system. In addition, at least one seep in the northwest area should be sampled to assess direct-contact hazards and determine the need for seep remediation. Since leachate was not available for sampling from the north end of the collection system in October 1991, it is recommended that sampling be performed during a wet season.

- Resample existing and proposed monitoring wells for TCL VOCs and inorganic substances. Sampling should be performed during a wet season for comparison with existing data. Data derived from aerial photographs, to include surface contours, have been used, in part, to tentatively identify some sampling locations.

- Resample surface water for TCL VOCs and inorganic substances, and sediment for full TCL parameters, during a wet season for comparison with existing data.

- In order to further assess air pathway exposures and provide data for a human health risk assessment, E & E proposes the collection of approximately six air samples at and around the site. Time-integrated air samples may be collected at Pump Station 1, at the leachate holding pond, and downhill of the site. Downhill samples should be collected during calm evening hours when temperature and moisture conditions may allow contaminants to settle downhill, impacting local residents.

- The current preliminary human health risk evaluation should be expanded to a full human health risk assessment or to the extent necessary to fulfill the objectives defined by NYSDEC.

- The current habitat-based risk assessment should be expanded to the extent necessary to fulfill the objectives defined by NYSDEC. At a minimum, this should include expansion of Step I to cover off-site downgradient receptors (i.e., springs) as well as completion of Step II, a Contaminant-Specific Impact Analysis (NYSDEC 1991b).

In addition to the above site-investigation activities, E & E would perform further literature review as well as geological and hydrologic field reconnaissances in the area in order to identify additional wells and springs further downgradient from the site. A preliminary interpretation of aerial photographs has provided some information in this report. This investigation is necessary because contamination may have migrated to significant depths and then traveled horizontally further than was initially expected.

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APPENDIX A

SEISMIC REFRACTION SURVEY REPORT

The appendix referenced in this report is not included due to its large size. The referenced appendix provides a listing of the data used to generate the profiles provided herein.

DRAFT

davenport/hadley
applied earth sciences

SEISMIC REFRACTION SURVEYS
WELLSVILLE - ANDOVER LANDFILL
WELLSVILLE, NEW YORK

Prepared for

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November 13, 1991

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INTRODUCTION

Davenport/Hadley, Ltd. was contracted by Ecology & Environment Engineering, P.C. to conduct approximately 10,000 feet of seismic refraction profiling at a closed landfill site near Wellsville, New York. The purpose of the seismic refraction investigation was to map the top of rock to assist in the location of monitoring wells and to provide additional information for input into other site characterization studies. Seismic line locations were selected by Ecology & Environment and are shown on Figure 1. The field work was conducted from August 19 through August 25, 1991.

FIELD PROCEDURE

The seismic data were collected using industry standard techniques. A Geometrics 2401 24-channel, signal enhancement seismograph was used to record the information. The equipment utilizes a floating-point digital recording system which allows true amplitude recovery of all data. The data is recorded on 3.5-inch diskettes for later analysis. A professional geophysicist inspected each record to insure that data quality objectives were being met.

The data for each seismic line were collected in separate 24-channel "spreads" consisting of 24 geophones laid out at 10-foot intervals. Surface elevations for each geophone were obtained by hand level surveys using the stake at the northwest corner of the site (Intersection of Lines A and E) as a control point with an assigned elevation of 1000 feet. For Lines A and D, a 10-foot gap was left between spreads. The remaining lines were laid out end to end by overlapping one geophone.

A sledgehammer impacted on a metal plate was used as an energy source. Multiple blows were recorded and stacked digitally to obtain sufficient energy for quality records. In most cases, record quality was very good. In a few instances, signal to noise was reduced due to ground coupling from rain. The worst two spreads, Line D - Spreads 3 and 5, were reoccupied in dry weather in order to obtain better data. Examples of field records are shown on Figures 2 and 3.

Hammer points (referred to as "shotpoints") were located at each end, in the middle and offset from each end in order to obtain coverage on the target refractor. The offsets were generally 115 feet (half a spread length) to obtain arrivals from the refractor. This shotpoint arrangement is necessary in order to utilize the newer interpretation methods, specifically the Generalized Reciprocal Method, as outlined below.

INTERPRETATION

The data were downloaded from the diskettes to a computer in order to pick first arrivals from the records. Some data were picked directly from the seismograph screen. Initial records were picked, plotted and interpreted in a preliminary manner the first day in order to determine that the project objectives were being met and to make sure that the field data acquisition procedures were appropriate. Daily field record inspection indicated no major changes in site conditions.

The first arrivals are plotted versus distance to obtain time-distance (T-D) graphs for analysis. Inspection of the T-D graphs provides a basis for assigning arrival times to individual layers. The data were analyzed using a program known as "RF" which was written by Richard Markiewicz of the U.S. Bureau of Reclamation and has been used extensively by the Bureau and their subcontractors for refraction data analysis. The program uses algorithms developed by Derecke Palmer for his "GRM" interpretation published by the Society of Exploration Geophysicists (The Generalized Reciprocal Method of Seismic Refraction Interpretation, Tulsa, 1980).

When the data is acquired in the proper format in the field, this interpretation method allows the computation of a depth to the refractor (top of rock) beneath each geophone. However, due to the way in the which seismic refraction data is acquired, good definition of the contact between the upper two layers is not always possible. At the Wellsville site most of the data could be analyzed using a three-layer system. One area along Line D (Spread 6) where the upper layer was removed for borrow yielded a two-layer case.

RESULTS

A seismic cross-section was computed for each spread. The individual spreads were then put together to present an entire line. Seismic cross-sections for each seismic line are shown on Figures 4 through 9. In general, the seismic data indicate three layers. The upper layer ranges in compressional wave velocity from 1,090 to 2,220 feet per second (fps). This range of velocity is typical of loose to dense, unsaturated surficial soil materials. The thickness of this layer varies from about 0 to about 30 feet, but is generally less than 10 feet thick.

The middle layer ranges in velocity from about 2,090 to about 5,400 fps. This range of velocity can represent either denser soil materials or weathered rock. Velocities less than 5,000 fps indicate unsaturated conditions. At saturation, the compressional wave velocity of the water (5,000 to 5,500 fps) dominates in soil or loose rock materials. The contact between the upper two layers is defined in most areas, but there are places where the depth to this interface is extrapolated.

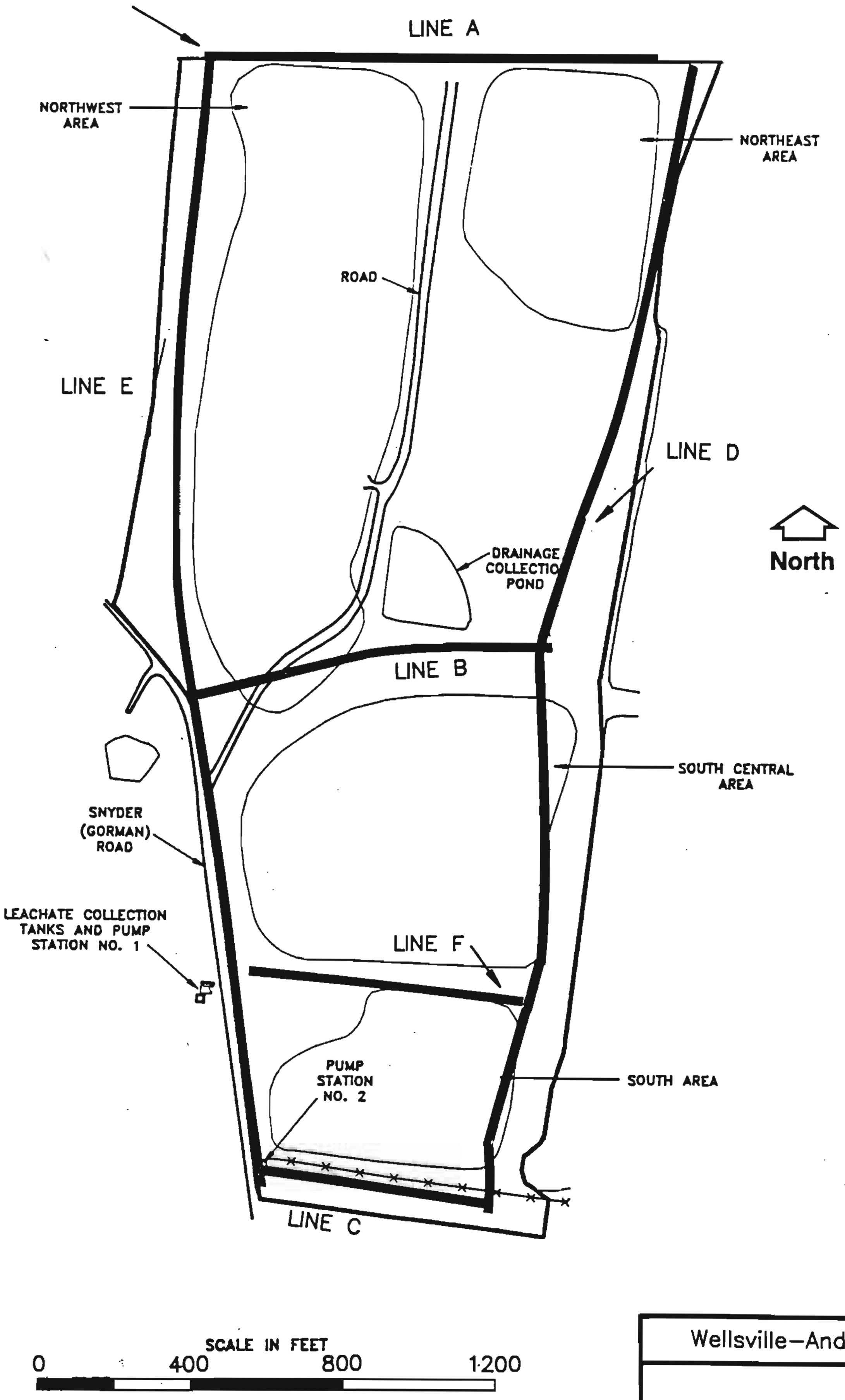
A two layer case was encountered on Spread 6 of Line D where surficial material was removed for borrow. In this area, the upper layer exhibits a velocity on the order of 2,100 fps which probably corresponds to the intermediate layer (V_2) of the adjoining spreads and represents weathered bedrock. The lower V_2 velocity in this area, as compared to other spreads, is most likely due to unloading (causing more open fractures) and desiccation.

The refractor at the Wellsville-Andover landfill site generally has a compressional wave velocity in excess of 10,000 fps. Velocities in this range are generally indicative of sound, unweathered bedrock. In some areas, particularly around the southern portion of the site (Lines C and E), the time-distance graphs exhibit curved rather than straight line segments for the third layer. This indicates that the refractor is increasing in velocity with depth. When a gradual contact (such as between slightly weathered and unweathered material) exists, it makes interpretation difficult since the curved section on the T-D graphs must be forced into discrete line segments in order to conform to refraction theory. For this interpretation, the curved portions were ignored except where curvature was significant. In these instances, the curved portion was divided into two sections. This may or may not be a valid assumption. This process yields a four layer interpretation with the third layer (V_3) representing a minimum bedrock velocity and the fourth layer (V_4) representing a maximum velocity. Both velocities are shown on the seismic cross sections where this occurs. Correlation with drilling data may assist in defining how these layers should be assigned in order to provide a more meaningful interpretation. The total data printout for each seismic line is included in Appendix A.

LIST OF ILLUSTRATIONS

Elevation Reference 1000 feet

DRAFT



Wellsville–Andover Landfill

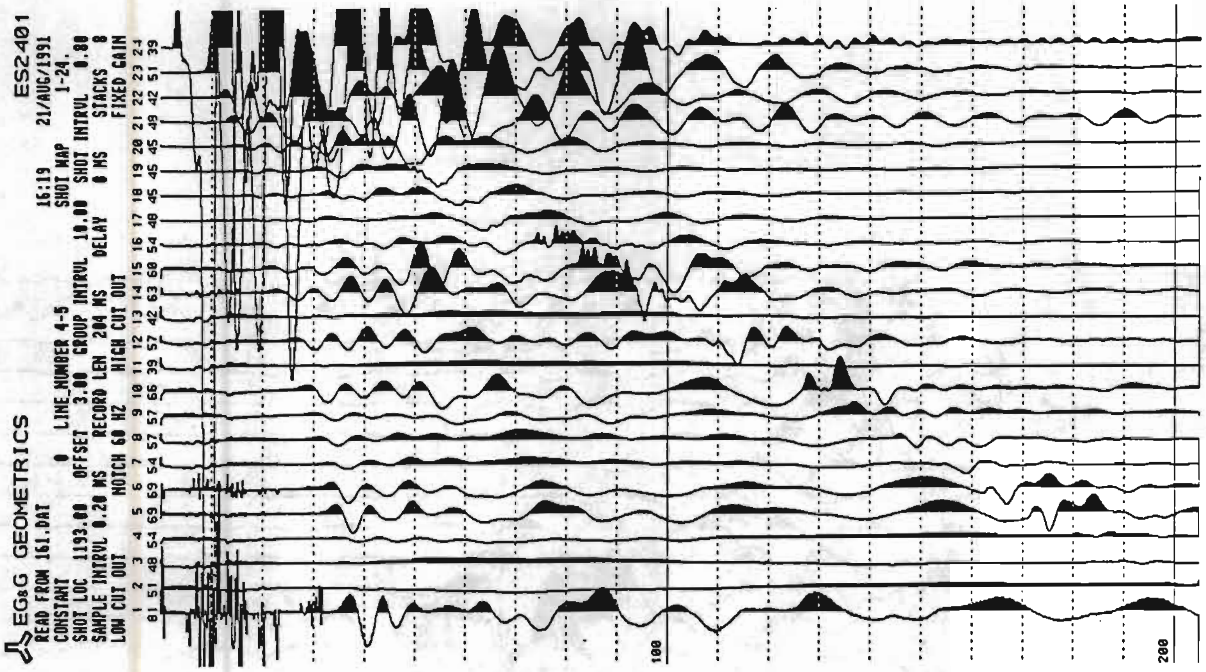
LOCATIONS OF SEISMIC PROFILES

Davenport/Hadley, Ltd.

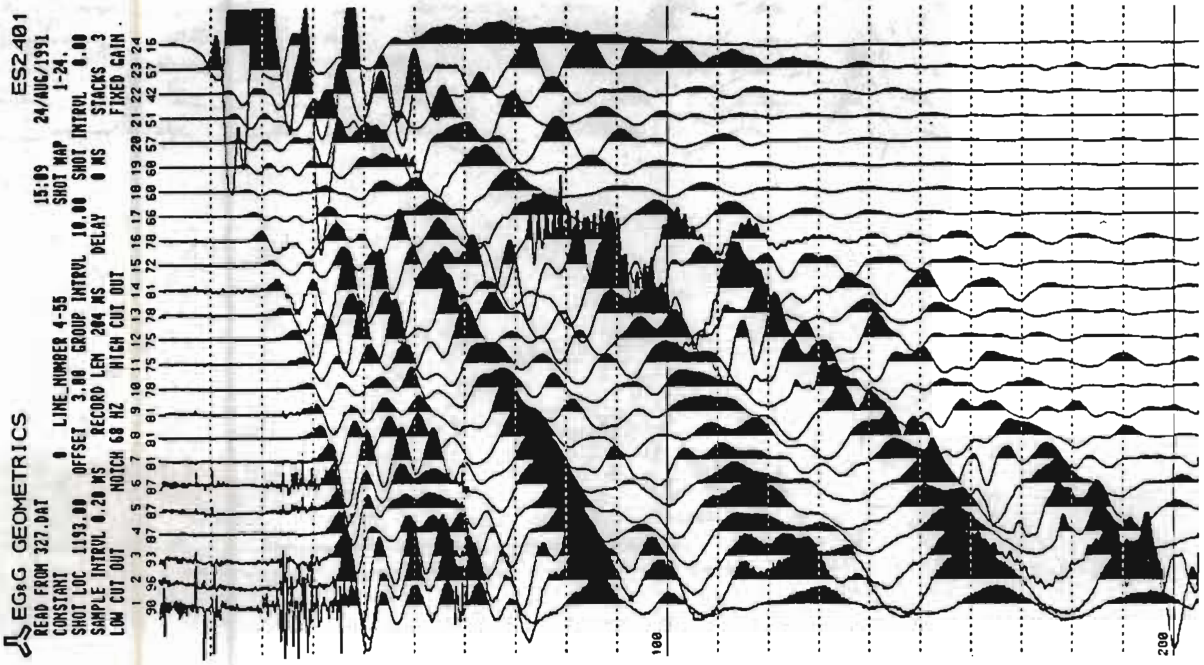
Oct. 1991 | Job No 91–23

Figure 1

D R A F T



a. Line D Spread 5 – recorded during rainstorm.



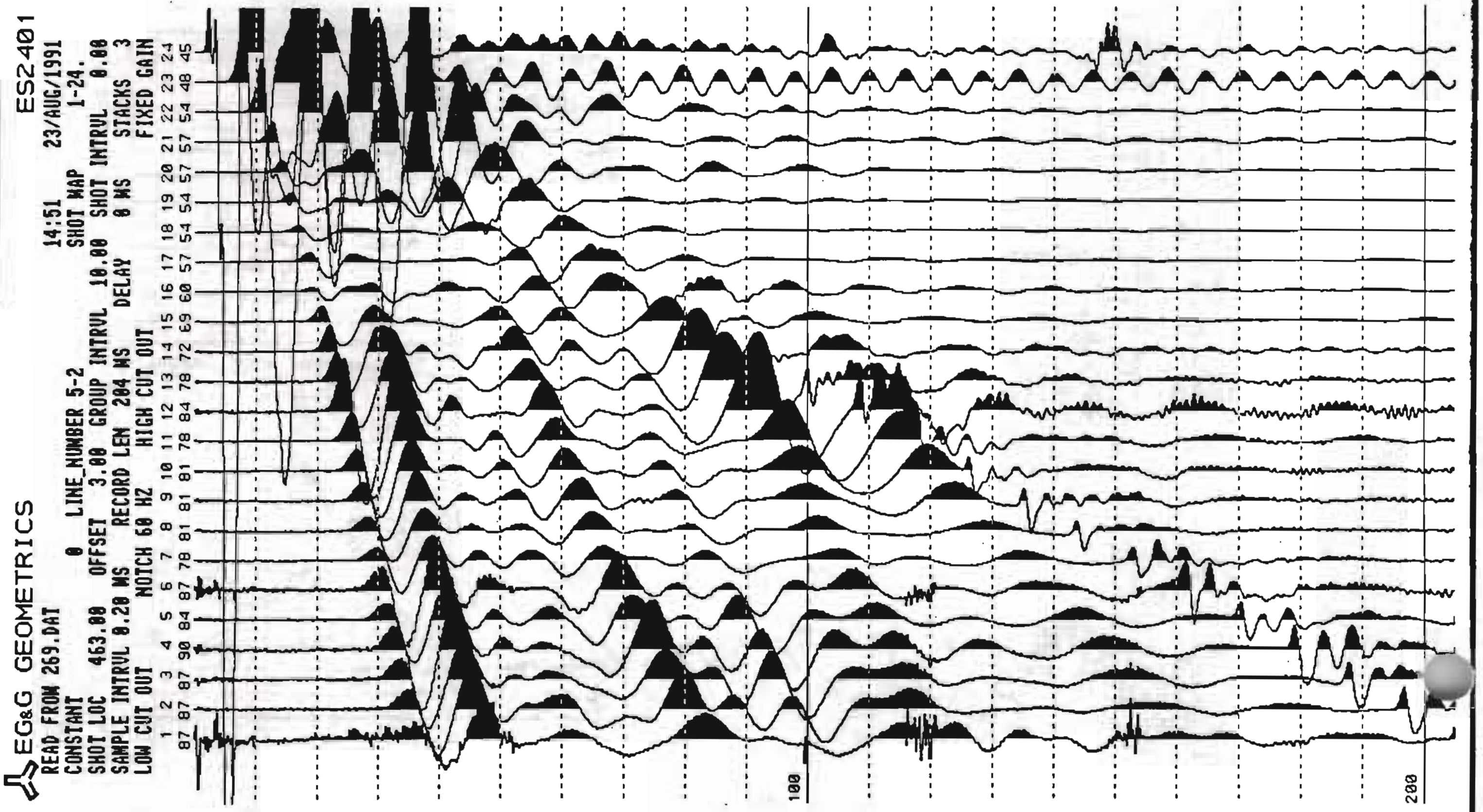
b. Line D Spread 5 – reoccupied and recorded in dry conditions.

Wellsville–Andover Landfill

EXAMPLES OF
FIELD RECORDS – LINE D

Davenport/Hadley, Ltd.
Oct. 1991 Job No 91–23
Figure 2

D R A F T

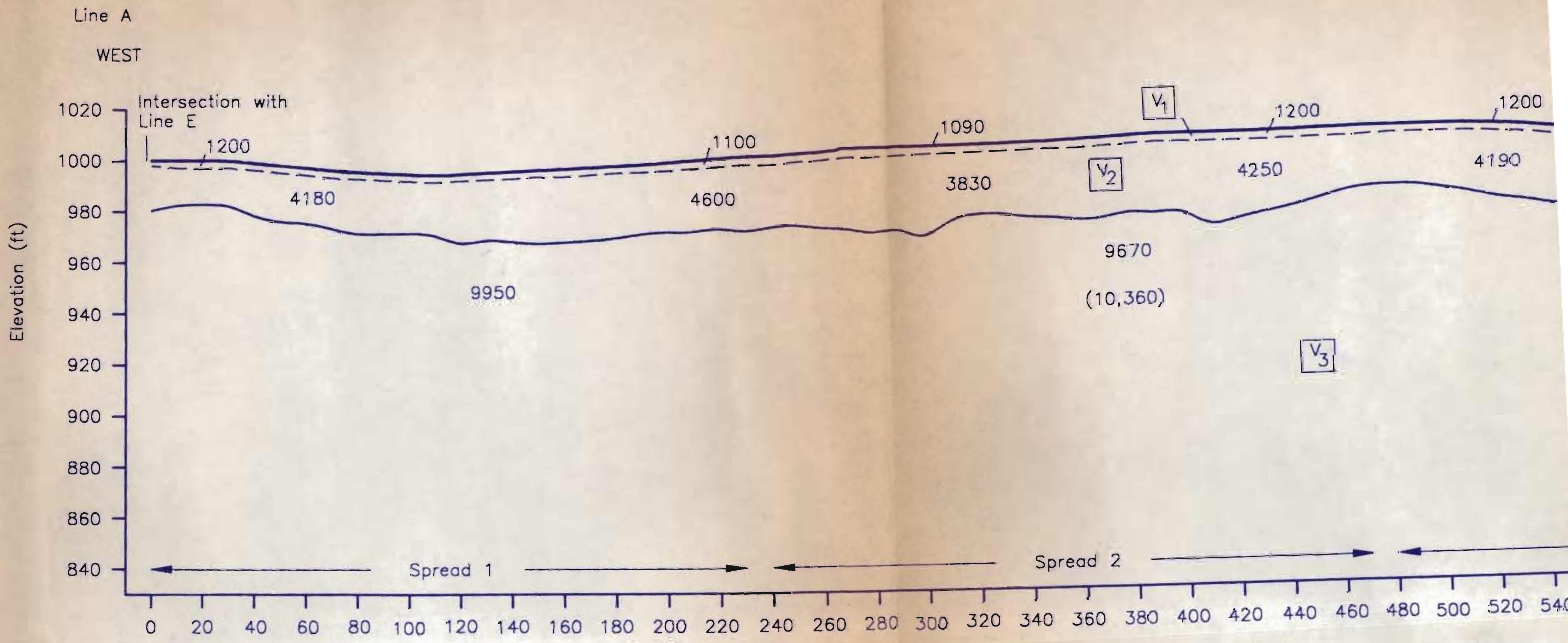


Line 5, Spread 2

Wellsville–Andover Landfill

EXAMPLE OF TYPICAL
FIELD RECORD – LINE E

Davenport/Hadley, Ltd.
Oct. 1991 Job No 91-23
Figure 3



LEGEND

——— Ground surface (obtained by hand survey in field)

– – – – – Seismic interface between V_1 and V_2

——— Seismic interface between V_2 and V_3

$\boxed{V_1}$ Seismic velocity ranges from 1090 to 2220 feet per second. Represents loose to medium dense overburden or extremely weathered bedrock (unsaturated).

Notes:

1. Elevation reference arbitrarily picked at 1000 fe
2. Velocities in parentheses indicate maximum velo
increases with depth

APPENDIX B

SUBSURFACE BORING LOGS FOR DEEP AND SHALLOW WELLS

Acronymns Used in Well Logs

ang - angular
blk - black
brach(s) - brachiopod fossils
brn - brown
conglom - conglomerate
cs - coarse
dk - dark
esp - especially
Fe - iron
fn - fine
frac(s) - fracture(s)
frag(s) - fragment(s)
grnd - grained
horiz - horizontal
incr - increased
lamin - laminated
lt - light
med - medium
orng - orange
oxid - oxidized
qtz - quartz
rec or recov - recovery
rnd - round
sh - shale
ss - sandstone or split spoon
sts - siltstone
subang - subangular
subrnd - subround
v - very
vert - vertical
wthrd - weathered

DRAFT

DRILLING LOG FOR MW-1D

Project Name Wellsville-Andover Landfill

Site Location Upgradient Well, N of ditch, in area of bedrock "low"

Date Started/Finished 8-27-91 / 8-30-91

Drilling Company American Auger

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature Richard Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / core (water)

Bit Size (s) ______ Auger Size (s) 4¼" ID

[✓ Auger]/Split Spoon Refusal 15.5' + 44' auger

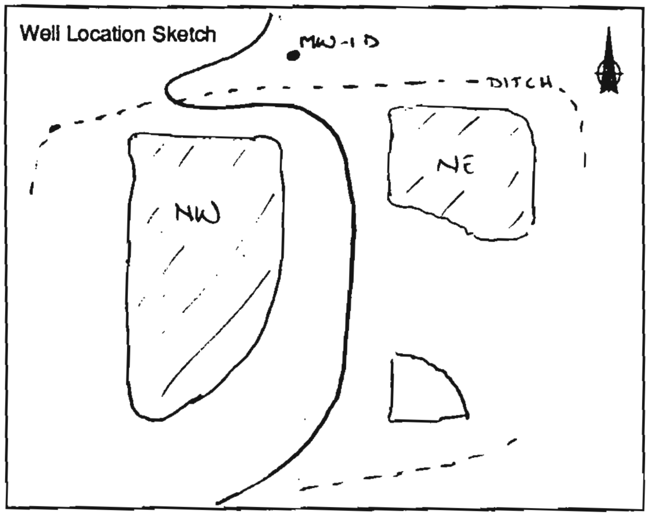
Total Depth of Borehole Is s.s. 44'

Total Depth of Corehole Is 75'

Water Level (TOIC)

Date	Time	Level(Feet)
9-4-91	0750	62.38
10-22-91	1325	66.87
11-20-91	1335	67.08
2-26-92	1000	68.80

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	[✓ HNu]/OVA (ppm)	Comments
1	1	2	8								0-2	HNu jumpy - Probably H_2O vapors
2	SB-1A	13	25									
3	2	34	33								0-5	?-able HNu H_2O in area of plant roots
4		50 5"	x									
5	3	6	11								0	
6		18	50 6"									
7	4	6	13								0	
8		22	50 5"									
9	5	35	14			1 ft/min @ 400psi					0	
10		17	22									
11	6	10	12								0	
12		24	24									
13	7	9	13								0	
14	~~MW-1A~~ SB-1B	24	24									
	8	18	22								0	

D R A F T

Stick-up ~~2.8~~ ft 2.7' ws 8/30/91

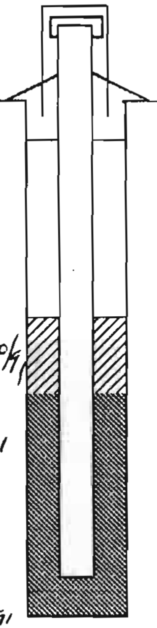
SCREENED WELL

Inner Casing Material PVC

Inner Casing Inside Diameter 2 Inches

Lock Number 3252

GROUND SURFACE



Top of Grout 3' ft

Borehole Diameter 8-10 Inches ft

Top of Seal at ~~60~~ 58' ft ws 8/30/91

Bottom of Seal at ~~63~~ 61.9' ws 8/30/91

Top of Screen at ~~65~~ 64' ft ws 8/30/91

Pack Type/Size:
☑ Sand # 02
☐ Gravel
☐ Natural

Bottom of Screen at ~~75~~ 74' ft ws 8/30/91

Quantity of Material Used:
Bentonite Pellets
Cement
Cement/ Bentonite
Grout ws 8/30/91

Top of Sand Pack ~~63~~ 61.9'

Screen Slot Size 0.010"

Screen Type 2" ID
☑ PVC Sch. 40
☐ Stainless Steel

Bottom of Hole at 75 ft

Bottom of Sandpack at 75'

OPEN-HOLE WELL

Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter Inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
1	0-0.3' Mottled grey + lt brown clay w/ silt + fine sand + ang. SS frags up to 1"	●	○	○
2	0.3-0.9' Dk brn organic-rich silt. 0.9-1.6' Same as 0-0.3'	○	⊗	○
3	2-3'5" (0.6' Rec) Same as above. Cuttings to 4' show angular SS	⊗	○	○
4	frags in silt matrix	⊗	○	○
5	4-6' (1.8' Rec) Lt brn silt w/ gravel (SS frags), clay, + fn sand	⊗	○	○
6	Minor clay (5-10%) + sand (5-10%). Friable + noncohesive.	⊗	○	○
7	Approx 40% of cuttings is SS frags up to 2" diameter	⊗	○	○
8	6-7'8" Same As Above - grades down to buff Fine sand w/ ang.	⊗	○	○
9	wthrd SS frags. Sand contains what looks like Mica (probably $CaCO_3$ crystals)	⊗	○	○
10	8-10' Same As Above but slightly higher clay content. Apparent	⊗	○	○
11	Fe in SS causes reddish-purple stains - esp. where soil contacts SS	⊗	○	○
12	10-12' Same as above but now tan to Lt brown (1.7' Rec.)	⊗	○	○
13	12-14' (1.6' Rec) Same as above but w/ shale frags too	⊗	○	○
14	14-16' (1' Rec) Mottled grey + brn silt w/ clay, fn sand, & shale	⊗	○	○
	frags. Auger refusal @ 15.5' - begin coring	⊗	○	○

D R A F T

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
	8	50 4"	x									Core to 16.5'
16							1	1'	90%		0	Hit soil again
17	9	50	x								0	Ref.@17'
18						8min/ft	2	1'	0		0	
19	10	50 1"	x								0	SS Ref@19'1" Auger to 21'
20		x	x									
21	11	50 5"	x								0	SS Ref@21'5" Auger to 23'
22		x	x									
23	12	50 4"	x								0	SS Ref@23'4" Auger to 25'
24		x	x									
25	13	50 3"	x								0	SS Ref@25'3" Auger to 27'
26		x	x									
27	14	40	50 3"								0	SS Ref@27'9" Auger to 29'
28		x	x									
29	15	50 5"	x								0	SS Ref.@29'5" Auger to 31'
30		x	x									
31	16	47	50 2"								0	SS Ref@31'8" Auger to 33'
32		x	x									
33	17	50 6"	x								0	SS Ref.@33.5' Auger to 35'
34		x	x									
35	18	50 6"	x								0	SS Ref.@35.5' Auger to 37'
36		x	x									
37	19	50 4"	x								0	SS Ref@37'4" Auger to 39'
38		x	x									
39	20	50 3'	x								0	SS. Ref.@39'3" Auger to 1.'
40		x	x									
41	21	50 3"	x								0	SS Ref.@41'3" Auger to 43'
42		x	x									
43	22	50 4"	x								0	SS Ref@43'4" Core@44'
44		x	x				3	2.5'	40%		0	

D R A F T

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	15.5-16.5' Grey laminated argillaceous shale or siltstone - mostly	○	○	○
17	fn grained like shale but contains ~5-10% visible qtz grains	○	○	○
18	16.5-17' Highly wthrd rock - clay w/ shaly fragments	⊗	○	○
19	17-19' Interlayered blk/dk grey shale + clay	○	○	○
20	19-19'1" Blk/dk grey highly wthrd shale (1" SS Rec.)	⊗	○	○
21	auger indicates same to 21'	⊗	○	○
22	21-21'5" Same as above (5" Rec.). Auger indates same to 23'	⊗	○	○
23	23-23.4' Same as above (4" Rec.) Auger indicates	⊗	○	○
24	same to 25'	⊗	○	○
25	25-25'3" Same as above w/ shale "platelets" to 1.5"	⊗	○	○
26	diameter + 1-2 mm thick. Drill 25-27' w/ 900 psi	⊗	○	○
27	(9" Rec) 27-27'9" same as above. Largest shale frag 1/2"	⊗	○	○
28	Auger indicates same to 29". Drill 27-29' @ 600 PSi	⊗	○	○
29	29-29'5" Same wthrd shale as above. Auger	⊗	○	○
30	indicates same to 31'. Drills fine @ 700 PSi (5" Rec)	⊗	○	○
31	(8" Rec.) 31-31'8" First 2" is same as above. Remainder is purplish-	⊗	○	○
32	grey highly wthrd shale (higher Fe content than above).	⊗	○	○
33	Still bone dry. Drill 31-33' @ 500 psi okay. Hard spot 32-32'3"	⊗	○	○
34	33-33'6" Same as above - after 4" returns to	⊗	○	○
35	dk grey. (6" Recov)	⊗	○	○
36	35-35'6" Same as above - both dk grey + purple-	⊗	○	○
37	grey wthrd shale. Fresh surface of shale frags is blk	⊗	○	○
38	37-37'4" (4" Rec) same as above - all w/ purple tinge	⊗	○	○
39	Hit hard rock w/ auger @ 38.5' 39-39'3" (3" Rec). Dk grey wthrd shale w/ minor qtz grains (5%)	⊗	○	○
40	more competent than above - looks like 15.5-16.5'	⊗	○	○
41	41-41'3" (3" Rec). Pulverized shale (dk grey) - Rock is competent but still augerable	⊗	○	○
42	43'-43'4" (4" Rec.) Same as above	⊗	○	○
43	44-46.5' Blk/Dk grey shale (laminated) 5' vertical	⊗	○	○
44	fracture @ 45' Bottom 4" is highly fractured	○	○	○
	+ shows Fe-staining - sign of water	○	○	○

MW-1D

DRAFT

missing 66

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46						3 cont.					
47						4	4.6' (94%)	61%		0.	highly fractured rust stains frequent especially 49-50'
48										0	
49										0	
50										0	
51											
52						5	4.7' 94%	69%		0	no signs of water
53										0	
54										0	
55										0	
56										0	
57						6	5.2' (100%)	91		0	no sign of H_2O
58										0	
59										0	
60										0	
61										0	
62						7	4.7' 94%	77		0	Clay at 65.7 due to coring. full of small rock fragments
63										0	
64										0	
65										0	
67						8	5.0' 100%	75%		0	clay layer yellow-gray water sign +rust in vertical fracture
68										0	
69										0	
70										0	
71											
72						9	5.0' 100%	65		0	vertical fracture 72.6-72.8 73.35-73.7 water at 72.6
73										0	
74										0	
75											

D R A F T

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
46	46.5-51.5' Non-fissile shale to shaly	☒	○	○
47	siltstone, dark grey, to black aws 8/29/91 laminated, open	☒	○	○
48	vertical fracture at 48.8-49.1, 49.5-49.8	☒	○	○
49	rust staining on horizontal fractures	○	☒	○
50	@ 46.6, 48.5, 48.6, 49.5, 49.8, VF 49.5-49.8	○	☒	○
51	fossiliferous layer ~ 47.35 graptolites?	○	☒	○
52	~~micaceous~~ calcareous 51.5-54.0' Interbedded shale (black) and sandstone.	☒	○	○
53	medium grained sandstone, dk and lt grey	☒	○	○
54	poorly sorted, shale fragments	☒	○	○
55	54.0-56.2' Black shale, laminated	☒	○	○
56	non-fissile to low	☒	○	○
57	rust staining at 55.0'	○	☒	○
58	56.5-61.7' Non fissile black shale to	☒	○	○
59	shaly siltstone, calcareous ~~micaceous~~ aws 8/29/91 laminated, competent	☒	○	○
60	SS layer at 58.0-58.35, bioturbation	☒	○	○
61	rust stains in horizontal fractures 57.55	☒	○	○
62	softer fissile shale at 57.55, 58.85, 59.9 61.7-66.7' Non fissile black shale to minor	☒	○	○
63	shaly siltstone. fissile black shale	☒	○	○
64	at 63.8', poorly laminated in	☒	○	○
65	general, calcareous ~~micaceous~~	☒	○	○
	66.7-68.6' Black shale, nonfissile	☒	○	○
67	poorly laminated generally with intermittent	☒	○	○
68	fissile layers. 68.6' clay layer yellow-grey	○	○	☒
69	slick at boundary with siltstone 68.6-71.3' Grey siltstone, competent, vertical	○	☒	○
70	fracture, 68.6-69.1 - rust staining	○	☒	○
71	shale pocket at 69.5, poorly to non laminated 71.3-71.7 Black shale, nonfissile same as above	○	☒	○
72	71.7-75.35' Black shale - fissile, laminated	○	☒	○
73	clay zone at 72.6 with very friable	○	☒	○
74	shale and rust stain in vertical fracture	○	☒	○
75	.01' siltstone layer 75.1 and 75.3	○	☒	○

MW-1D

MW-11S

DRAFT

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77												
78												
79												
80												
81												
82												
83												
84												
85												
86												
87												
88												
89												
90												
91												
92												
93												
94												
95												
96												
97												
98												
99												
100												
101												
102												
103												
104												
105												

D R A F T

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	 Moist	 Wet
	75.35-76.7' interbedded sandstone and shale fine grained red grey sandstone at	○	○	○
77	75.35 - 75.7', grey at 75.95 and 76.4-76.6	○	○	○
78	Note TD actually 75 feet	○	○	○
79	so log off by 1.7'	○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

MW-1D

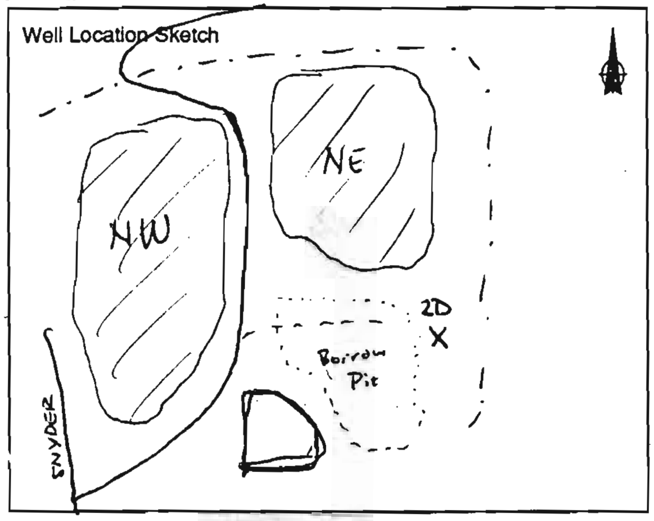
DRILLING LOG FOR MW-2D

Project Name Wellsville-Andover LF.
Site Location E side of N borrow pit; SSE of NE fill area
Date Started/Finished 9-3-91 / 9-4-91
Drilling Company American Auger + Ditching
Driller's Name Lee Penrod
Geologist's Name Rick Watt
Geologist's Signature R. Watt
Rig Type (s) Mobile B-57
Drilling Method (s) Auger / core (water)
Bit Size (s) HQ Auger Size (s) 4¼" ID
Auger/Split Spoon Refusal 24'
Total Depth of Borehole Is 24'
Total Depth of Corehole Is 61'

Water Level (TOIC)

Date	Time	Level(Feet)
10-22-91	0955	52.60
11-20-91	1338	52.70
2-26-92	1036	51.74

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/[✓ OVA] (ppm)	Comments
	1	6	14								0	0.6' Rec.
1		29	32									
2	2	25	32								0	0 Rec. 1st Time will try again
3		36	34									1.9' Rec 2nd try
4	3	15	17								0	1.0' Rec.
5		15	38								1 in augers	
6	4	10	28								<1 +	1.2' Rec.
7		20	50 3"								fluctuating	
8	5	50	50 4.5"								5 in auger	0.7' Rec.
9		x	x								0 in SS	
10	6	18	50 3"								Auger: OVA=8 HNu=0 SS=0	Rock @ 10½' based on augers
11		x	x									
12	7	50 4"	x								0 (SS)	0.2' Rec.
13		x	x									
14	8	10	50 5"								0	1st 10 is probably soil from pit.

DRAFT DNR-2A

SCREENED WELL

Stick-up 2.5' ft

Inner Casing Material Sch. 40 PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 3 ft

Borehole 8-10 inches
Diameter ______ ft

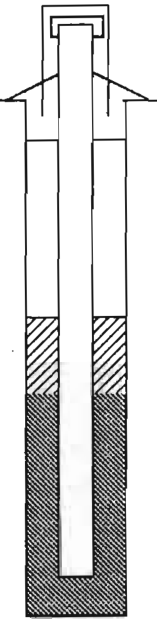
Top of Seal at 36.5 ft

Bottom of Seal at 43'

Top of Screen at 49' ft

Pack Type/Size:
☒ Sand #2 Q Rok
☐ Gravel ______
☐ Natural ______

Bottom of Screen at 59' ft



Lock Number 3252

Quantity of Material Used:
Bentonite Pellets 0
Cement ______
Cement/ Bentonite ______
Grout ______

Top of Sand Pack 43'

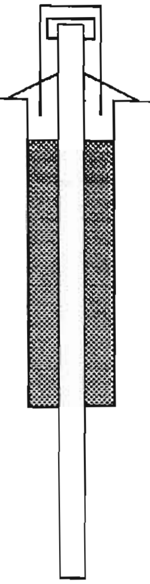
Screen Slot Size 0.010"

Screen Type Sch. 40
☒ PVC 10 SLOT
☐ Stainless Steel ______

Bottom of Hole at 61 ft

Bottom of Sandpack at 61

OPEN-HOLE WELL



Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ Inches

Top of Grout ______ ft

Bottom of Outer Casing ______ ft

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Grout/ Casing ______ ft

Corehole Diameter ______

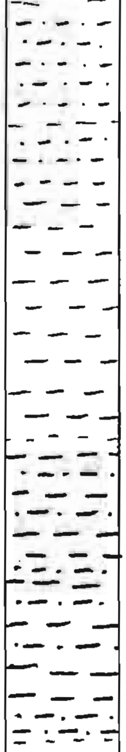
Bottom of Corehole ______ ft

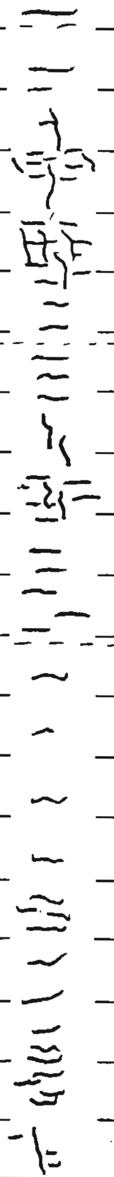
NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0.2' Grass + Organics followed by med. brn silt w/ clay, sand	☒	○	○
2	+ gravel. Sand (fn - cs) + gravel (fn) in SS particles	☒	○	○
3	2-4' Same as above mottled w/ grey clay in bottom 6" Minor	☒	○	○
4	CaCO3 ~~Mica~~ content.	☒	○	○
5	4-6' Same as above. Clay content increasing downward,	☒	○	○
6	CaCO3 ~~Mica~~ content increasing (~5-10% @ 6') Contains ~20%	☒	○	○
7	sub ang. sandstone frags.	○	☒	○
8	6-8' (Ref. @ 7'9") Greenish brown clay w/ silt, slightly	○	☒	○
9	Moist.	☒	○	○
10	8 - 8'10.5" Fragments of calcareous ~~micaceous~~, dk grey, laminated	☒	○	○
11	Siltstone to 1.5" diameter - angular.	☒	○	○
12	10 - 10'9" Same as 8-8'10" but w/ dry grey clay (dust)	☒	○	○
13	12 - 12'4" Same as immed. above. Auger cuttings fr 10-12'	☒	○	○
14	indicate purplish grey clay	☒	○	○
		☒	○	○

DRAFT

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
		x	x								0	0.5' Rec.
16	9	46	50 3"								0	0.4' Rec.
17		x	x									
18	10	20	50 4"								0	0 4' Rec.
19		x	x									
20	11	25	50 4"								0	0.3' Rec.
21		x	x									
22	12	25	50 2"								0	0.5' Rec.
23		x	x									
24	13	20	50 3"			6-7 min per ft.	1	2.2' 100%	86%		0	0.5' Rec. SS
25		x	x								0	2.2' Core Rec.
26						4½ min /Ft	2	4.8' 96%	11%		0	Definite water-bearing zone, but may be seasonal. Will core 8' more + then bailer test.
27												
28												
29												
30												
31							3	5' 100%	46%		0	
32												
33												
34												
35												
36							4	4.9' 98%	47%		0	TD=41' - bailer test - makes no water ∴ core 10' more.
37												
38												
39												
40												
41							5	4.8' 100%	27%		0	
42												
43												
44												





MW-2D

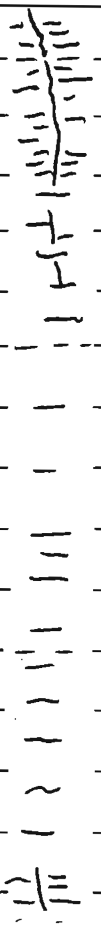
NKN-2D

D R A F T

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16	14-14.5' Wthrd maroon med-grained SS followed by wthrd	⊗	○	○
17	maroon fissile shale.	⊗	○	○
18	16-16'9" Interbedded wthrd maroon SS + shale.	⊗	○	○
19	18-18'9" wthrd dk grey fissile shale. Auger cuttings	⊗	○	○
20	indicate highly wthrd shale from ~12' ⇒	⊗	○	○
21	20-20'10" Same as immed. above	⊗	○	○
22	22-22'8" Same as above. Competent rock layer @	⊗	○	○
23	~22.5' based on auger response (~1/2' thick)	⊗	○	○
24	24-24'9" wthrd grey shaly siltstone, fissile.	⊗	○	○
25	Change in auger response - hard competent rock @ ~24'	○	○	○
26	Auger refusal just > 24'.	○	○	○
27	24-26.2' Grey laminated shaly siltstone, competent. Only 1 horizontal	○	○	○
28	wthrd (Fe-stain) fracture @ 26.2'	○	○	○
29	26.2-26.75' Grey lamin. shaly siltstone - stained brown from 26.4' down	○	○	○
30	(water table?)	○	○	○
31	26.75-31.2' Heavily wthrd + fractured dk grey/blk fissile shale	○	○	○
32	vertical + horiz. frac's Fe-stained. Vert. frac's @ 27.4-31'. Heavily	○	○	○
33	fract'd 27.9-28.1' + 29-30.2' (horiz + vert).	○	○	○
34	31.2-35.4' Heavily wthrd + fractured fissile dk grey/blk shaly	○	○	○
35	w/ silty interbeds (maroon) esp. @ 31.2-31.7' + 32.8-33.3'	○	○	○
36	35.4-36.2' Shaly siltstone (grey) w/ blk shale interbeds - irregular	○	○	○
37	flow features more than interbeds. Vert. frac's @ 32.6-33' +	○	○	○
38	33.4-33.8'. Heavily fract'd from 33.4-33.8' (horiz. + vert.). Most	○	○	○
39	frac's are Fe-stained.	○	○	○
40	36.2'-41.2' Dk grey/blk silty shale w/ minor siltstone	○	○	○
41	interbeds. Shale is laminated + moderately competent.	○	○	○
42	Few horiz. fracs., some Fe-stained; no vert. fracs.	○	○	○
43	39.7-41.2' is heavily fract'd + wthrd.	○	○	○
44	41.2-41.4 Fract'd blk shale	○	○	○
	41.4-42.2' Grey shaley siltstone w/ 1 horiz. Fe-stained frac.	○	○	○

42.2'-44.1' Lamin. fissile blk shale w/ minor siltstone interbeds.
Numerous horiz. Fe-stained fractures.

D R A F T

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47						6	5' 100%	42%		0	
48											
49											
50											
51											
52						7	4.9' 98%	78%		0	No water gain/loss until this run - lost 30-40 gals.
53											
54											
55											
56											
57						8	4.4' 98%	59%		0	cored 4.5' lost little water
58											
59											
60											
61											
62											
63											
64											
65											
67											
68											
69											
70											
71											
72											
73											
74											
75											

MW-2D

D R A F T

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46	44.1-44.3 Grey shaley siltstone	○	○	○
47	44.3-46' Dk grey/black fissile shale. Heavily fract'd + wthrd	○	○	○
48	from 4$\overset{5}{\cancel{4}}$.4-46'. Vert. Frac's from 44.3-44.8' + 45.4-46'	○	○	○
49	46-46.4' Shaly siltstone w/ minor sandstone interbeds.	○	○	○
50	Horiz. + vert. Fe-stained fracs.	○	○	○
51	46.4-48' Siltstone to fn grnd sandstone, wthrd (Fe-stain) w/	○	○	○
52	vert. fract. containing 1/4" clay seam.	○	○	○
53	48-48.8' Poorly sorted SS containing rnd to subrnd qtz grains	○	○	○
54	w/ vert. Frac.	○	○	○
55	48.8-49.5' Interbedded shale + fn grnd SS w/ vert. Fe-stained frac.	○	○	○
56	49.5-51' Fn grnd SS w/ interbedded shale + cs grnd SS. Competent	○	○	○
57	51-56' Competent greenish-grey ~~micaceous~~ calcareous sandstone,	○	○	○
58	laminated w/ v. thin interbeds of shale or siltstone.	○	○	○
59	56-56.8' same as 51-56'	○	○	○
60	56.8-58.9' Grey ~~micaceous~~ calcareous sandstone containing numerous "clasts"	○	○	○
61	of black shale ranging from ~~1mm~~ to 3" long	○	○	○
62	58.9-59' Fe-stained cs grnd SS to conglomerate underlain by	○	○	○
63	thin shale layer	○	○	○
64	59-59.4' Grey SS w/ coal stringers between 59.1 + 59.3'	○	○	○
65	59.4-60.5 Same greenish-greyish brn SS as above but w/ vert. +	○	○	○
67	numerous horiz. Fe-stained fracs. Same clay in vert. frac.	○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75		○	○	○
		○	○	○

MW-2D

DRAFT

DRILLING LOG FOR MW-2S

Project Name Wellsville-Andover L.F.

Site Location E side of N borrow pit, SSE of NE Fill area

Date Started/Finished 10-3-91 / 10-3-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) ______ Auger Size (s) 4 1/4" ID

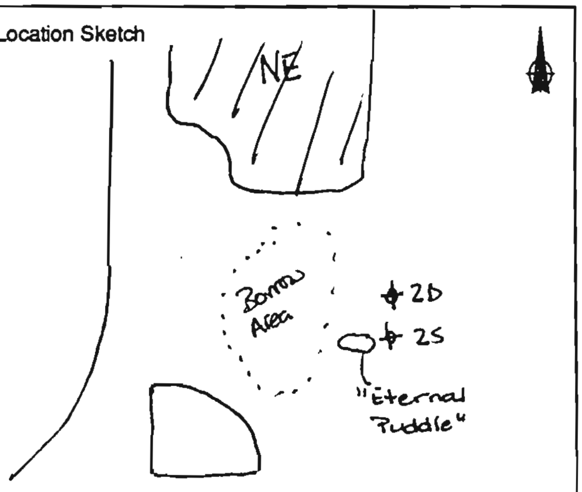
Auger/Split Spoon Refusal 10'

Total Depth of Borehole Is 9'

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	0950	9.75
11-20-91	1341	8.69
2-26-92	1034	6.06

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1												
2												
3												
4												
5												
6												
7	SB-2A (6.5-7.5')	11 20	11 25								HNu 0 OVA 1 ppm	Collect 1 split spoon for resample of SB-2A
8												
9												
10												
11												
12												
13												
14												

DRAFT

Stick-up ~2.5 ft

SCREENED WELL

Inner Casing Material Sch. 40 PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 0 ft

Borehole Diameter 8-10 inches ft

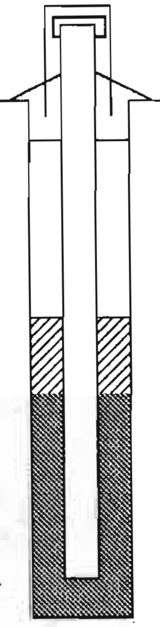
Top of Seal at 3 ft

Bottom of Seal at 4'

Top of Screen at 5 ft

Pack Type/Size:
☒ Sand #2 Q-ROK
☐ Gravel
☐ Natural

Bottom of Screen at 9 ft



Lock Number 3252

Quantity of Material Used:
Bentonite Pellets
Cement
Cement/ Bentonite
Grout

Top of Sand Pack 4'

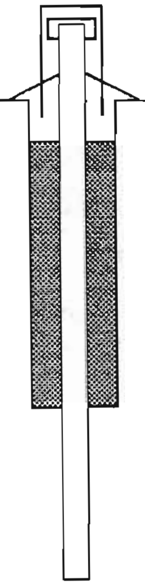
Screen Slot Size 0.010"

Screen Type Sch. 40
☒ PVC
☐ Stainless Steel

Bottom of Hole at 9 ft

Bottom of Sandpack at 9'

OPEN-HOLE WELL



Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
	See Log for MW-2D for lithology	○	○	○
1		○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5	Medium brown gravelly sandy silt w/ clay (collected 1 spoon	⊗	○	○
6	For resampling).	○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○

D R A F T

DRILLING LOG FOR MW-3D

Project Name Wellsville-Andover Landfill

Site Location SW corner of drainage collection pond

Date Started/Finished 9-5-91/9-6-91

Drilling Company American Auger + Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger /Core

Bit Size (s) HQ Auger Size (s) 4 1/4" ID

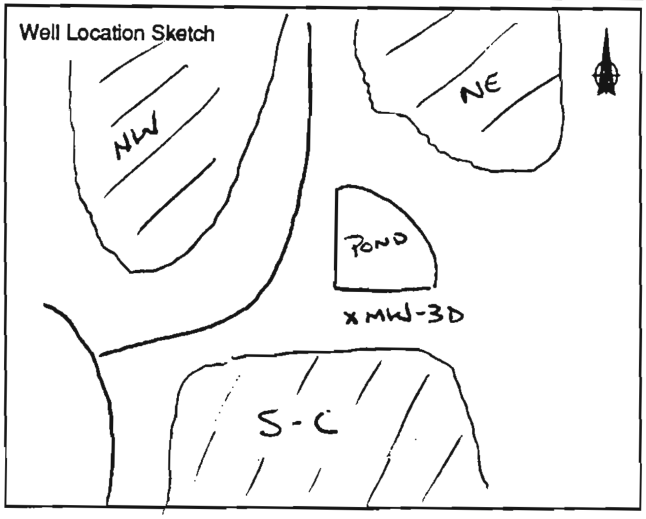
Auger/Split Spoon Refusal 25'

Total Depth of Borehole Is 25'

Total Depth of Corehole Is 41.6'

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1042	13.95
11-20-91	1223	14.14
2-26-92	1022	12.01

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1	1	7	8								0	1.9' Rec.
2		7	10									
3	2	21	16								0	1.2' Rec.
4		14	18									
5	3	5	10								0	2.0' Rec.
6		8	19									
7	4	5	10								0	1.1' Rec.
8		15	21									
9	5	2	8								0	1.4' Rec.
10		10	16									
11	6	3	50								0	1.3' Rec.
12		50 5"	^									
13	7	9	11								0	2.0' Rec.
14		10	30									
	8	22	16								0	1.2' Rec

D R A F T

MW-3D

Stick-up 2.5' ft

SCREENED WELL

Inner Casing Material Sch. 40 PVC

Inner Casing Inside Diameter 2 inches

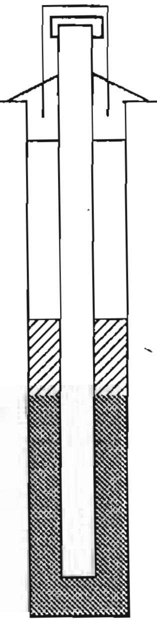
Lock Number 3252

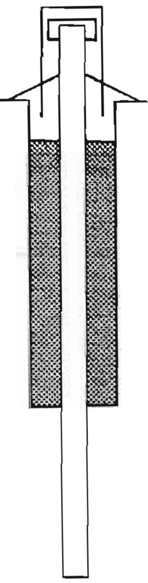
Stick-up ____ ft

OPEN-HOLE WELL

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches





Top of Grout 3 ft

Borehole Diameter 8-10 inches ____ ft

Top of Seal at 22.5 ft

Bottom of Seal at 28

Top of Screen at 30 ft

Pack Type/Size:
☒ Sand #2 QROK
☐ Gravel ____
☐ Natural ____

Bottom of Screen at 40 ft

Quantity of Material Used:
Bentonite Pellets -
Cement 3'
Cement/ Bentonite 19.5'
Grout ____
Top of Sand Pack 28'
Screen Slot Size 0.010"
Screen Type ____
☒ PVC Sched. 40
☐ Stainless Steel ____

Bottom of Hole at 41.6' ft

Bottom of Sandpack at 41.6'

Top of Grout ____ ft

Bottom of Outer Casing ____ ft

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Grout/ Casing ____ ft

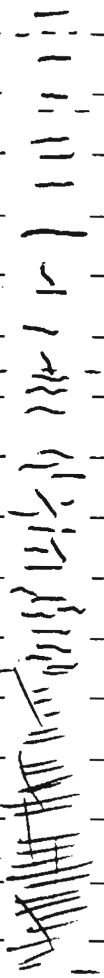
Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0-0.9' Brn silt w/ $\overset{10\%}{\text{clay}}$ + $\overset{5\%}{\text{sand}}$ + organics (roots)	○	⊗	○
2	0.9-1.9' Mottled lt brn/grey silt w/ $\overset{15\text{-}20\%}{\text{clay}}$ + $\overset{5\%}{\text{sand}}$ + $\overset{5\%}{\text{gravel}}$. Also	⊗	○	○
3	contains minor black organics (coal?)	⊗	○	○
4	2-3.2' Buff sandstone cobble followed by buff to brn silt w/ $\overset{5\%}{\text{clay}}$	⊗	○	○
5	$\overset{(20\%)}{\text{sand}}$ + $\overset{10\%}{\text{gravel}}$. Contains areas of Fe-stain	⊗	○	○
6	4-6' Light to med. brn silt w/ clay, sand + gravel. Gravel	⊗	○	○
7	is subrnd SS frags. Contains areas of Fe-stain	⊗	○	○
8	6-8' Same as above but incr. gravel content (gravel to 1")	⊗	○	○
9	8-10' Same as above, but gravel/cs sand up to 20-25%. SS frags	⊗	○	○
10	(subang) to "	⊗	○	○
11	10-12' 4" of material same as 8-10' followed by wthrd, calcareous ~~[illegible]~~	⊗	○	○
12	SS bedrock (sand + SS frags to 1" x 1/4")	⊗	○	○
13	12-14' Same as 6-8'	⊗	○	○
14	14-16' Same as immed. above but increased content of ang.	⊗	○	○
	sandstone frags.	⊗	○	○

D R A F T

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
		17	19									
16	9	24	24								0	1.0' Rec.
17		19	25									
18	10	16	18								0	1.4' Rec.
19		20	20									Steam generated by augers.
20	11	15	25								0	1.6' Rec.
21		30	30									Must be minor water - steam generated.
22	12	15	20								0	1.8' Rec.
23		20	15									steam - a lot
24	13	10	20								0	0.9' Rec.
25		50 1"	x									steam generated
26							1	1.8'			0	
27								100%	67%			
28								4.9'	69%			
29							2	100%			0	
30												
31												
32												Heavily wthrd - good
33							3	4.4'	27%		0	water bearing zone - will
34						4min/ft		89%				core 5' more + then
35												check recharge
36												
37												
38								5'				
39							4	100%	0			
40						2min/ft @ bottom						
41												
42												
43												
44												

MW-3D

DRAFT

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16	16-18' Same as above but more grey now. Gravel (to 1/2")	☒	○	○
17	is subround SS of varying colors (brn, grey, maroon, etc.)	☒	○	○
18	18-20' Same as above but sand content incr. to ~ 30-35%.	☒	○	○
19	20-22' Same as above.	☒	○	○
20	22-24' Same as above, sand content down slightly, +	☒	○	○
21	gravel content incr. Gravel is subrnd to ang. SS.	☒	○	○
22	24-25' Same as above Auger refusal @ 25'	☒	○	○
23	~~25-25.5' Same as above.~~ this was in auger bit. RW	○	○	○
24	25 - 26.8', ~~25-27.25~~ RW Greenish grey Calcareous ~~Micaceous~~ RW fn to Med. ~~med~~ RW grnd sandstone	○	○	○
25	w/ thin conglomerate interbeds. Conglom. at end of run	○	○	○
26	is Fe-stained + contains subrnd qtz + subang SS +	○	○	○
27	Shale frags.	○	○	○
28	26.8 - 31.7' Conglomeratic in top 4" otherwise same sandstone	○	○	○
29	w/ vert fracs @ 30.3' ~~29'~~ RW + 31.7' + horiz. clay filled seam @	○	○	○
30	29.1'.	○	○	○
31	31.7' - 36.6' Same sandstone w/ high CaCO3 ~~mica~~ RW content stained	○	○	○
32	orange brown to 31.9' + greenish-grey to 32.0'. High blk	○	○	○
33	organic content (coal? stingers?) from 32-32.2'.	○	○	○
34	Same SS as 26-32' from 32.2-33.3'. Heavily fract'd	○	○	○
35	SS w/ lower CaCO3 ~~mica~~ content from 33.3-36.6'. Vert. frac's @	○	○	○
36	33.4', 34.2', 34.4', 34.9-36.6'. Clay filled frac's from 33.3-	○	○	○
37	36.6'. Fe-stains throughout.	○	○	○
38	36.6 - RW ~~41.6'~~ 38.6' Heavily fract'd + wthrd shaly sandstone	○	○	○
39	w/ numerous horiz + vert. fractures, many clay-filled.	○	○	○
40	38.6 - 41.1' Heavily fract'd + wthrd, black, fissile shale w/	○	○	○
41	numerous horiz. + vert. fractures many clay filled	○	○	○
42	41.1-41.3' Cs sandstone to fine conglomerate, wthrd.	○	○	○
43	41.3 - 41.6' Fn to med grnd SS as above.	○	○	○
44		○	○	○
		○	○	○

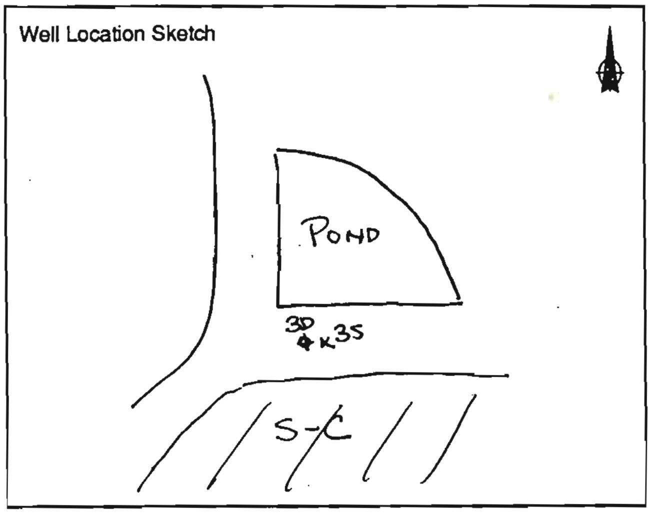
MW-3D

DRILLING LOG FOR MW-3S

Project Name Wellsville-Andover Landfill
Site Location In swale near SW corner of drainage collection pond
Date Started/Finished 10-3-91 / 10-3-91
Drilling Company American Auger & Ditching
Driller's Name Lee Penrod
Geologist's Name Rick Watt
Geologist's Signature R. Watt
Rig Type (s) Mobile B-57
Drilling Method (s) Auger
Bit Size (s) ____ Auger Size (s) 4 1/4" ID
Auger/Split Spoon Refusal 19'
Total Depth of Borehole Is 19'
Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1041	15.40
11-20-91	1224	7.17
2-26-92	1025	6.18

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	[✓ HNu]/OVA (ppm)	Comments
1	SB-3A	8 10	7 12								0	Take split spoon to resample 3A
2												
3												
4												
5												
6												
7												
8												
9												
10												
11	SB-3B	6 14	38 36									Take spoon to resample 3B
12												
13												
14												

MW-3S

DRAFT

Stick-up ~2.5 ft

Inner Casing Material PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 3 ft

Borehole Diameter 8-10 Inches ft

Top of Seal at 5 ft

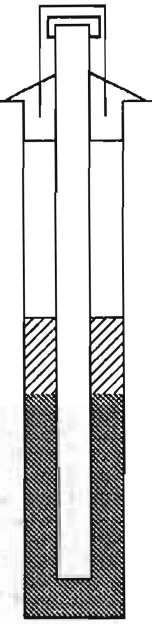
Bottom of Seal at 7'

Top of Screen at 9 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 19 ft

SCREENED WELL



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets
Cement
Cement/ Bentonite
Grout

Top of Sand Pack 7'

Screen Slot Size 0.010"

Screen Type
☒ PVC Sch. 40
☐ Stainless Steel -

Bottom of Hole at 19 ft

Bottom of Sandpack at 19'

OPEN-HOLE WELL

Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter Inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
1	See log for MW-3D for lithology	○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
		○	○	○

D R A F T

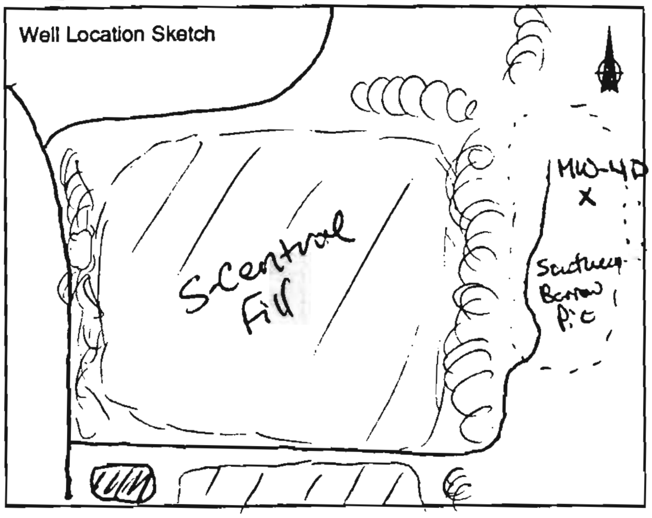
DRILLING LOG FOR MW-4D

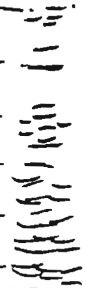
Project Name Wellsville-Andover LF.
Site Location N end of S borrow pit.

Date Started/Finished 9-9-91
Drilling Company American Auger + Ditching
Driller's Name Lee Penrod
Geologist's Name Rick Watt
Geologist's Signature R Watt
Rig Type (s) Mobile B-57
Drilling Method (s) Auger / core
Bit Size (s) HQ Auger Size (s) 4 1/4" ID
Auger/Split Spoon Refusal 9'
Total Depth of Borehole Is 9'
Total Depth of Corehole Is 23.3'

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1100	12.26
11-20-91	1346	11.57
2-26-92	1044	5.73

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
	1	6	10								0 HNu	2.0' Rec.
1		16	26									MW-4D 1-2' Geotech
2	2	12	15								0 HNu	1.7' Rec.
3		28	32									SB-4A VOA+metals.
4	3	44	24								0 HNu	1.6' Rec.
5		28	20									
6	4	19	11								0 HNu	1.6' Rec.
7		14	18									Auger grinds on more competent rock @ 8'
8	5	10	10									1' Rec
9		50 1"	X									8-11.3'
10							1	2.8' 86%	29%		0	Hard Rock-core
11												900 psi downpressure
12						2'50"/ft						11.3-16.3'
13							2					900psi
14												

D R A F T MW-4D

Stick-up 2.5' ft

SCREENED WELL

Inner Casing Material PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 0 ft

Borehole 8-10 Inches Diameter ___ ft ___

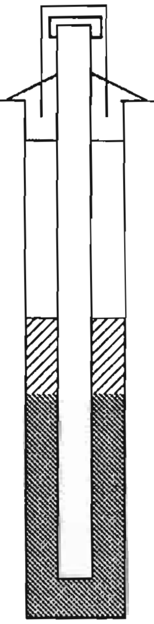
Top of Seal at 7.5' ft

Bottom of Seal at 10'

Top of Screen at 12 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel ___
☐ Natural ___

Bottom of Screen at 22 ft



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets 2.5'

Cement Portland Type 1

Cement/ Bentonite ___

Grout ___

Top of Sand Pack 10'

Screen Slot Size 0.010"

Screen Type
☒ PVC sch. 40
☐ Stainless Steel ___

Bottom of Hole at 23.3' ft

Bottom of Sandpack at 23.3'

OPEN-HOLE WELL

Stick-up ___ ft

Inner Casing Material ___

Inner Casing Inside Diameter ___ Inches

Top of Grout ___ ft

Bottom of Outer Casing ___ ft

Borehole Diameter ___ ft

Bedrock ___ ft

Bottom of Rock Socket/ Grout/ Casing ___ ft

Corehole Diameter ___

Bottom of Corehole ___ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	 Moist	 Wet
1	0-0.5' Brown silt w/ sand + organics (grass rootlets).	☒	○	○
2	0.5-2.0' Brown (mottled w/ minor grey + orng) silt w/ sand + gravel -	☒	○	○
3	Wthrd shaley sandstone bedrock. Gravel is wthrd subang to ang. shaley SS frags	☒	○	○
4	2-4' Same as above - heavy wthring (oxidation) Thin bedded	☒	○	○
5	structure of shaley SS is still intact	☒	○	○
6	4-6' Same as above - sandy shale, v. fissile.	☒	○	○
7	6-8' Same as above - v. slightly moist zone @ 7'	☒	○	○
8	8-9' Same as above - refusal on competent wthrd	☒	○	○
9	fissile ~~shales~~ brn sandy shale.	☒	○	○
10	8.3-9.5' slightly wthrd brnish-grey fn-grnd, well-cemented	○	○	○
11	sandstone; fossiliferous (brachiopod)	○	○	○
12	9.5-11.3' Blk fissile shale; highly fract'd w/ oxid. on bedding	○	○	○
13	planes - Clay w/ sand filled frac. btwn SS + sh.	○	○	○
14	11.3-16.3' V. Heavily fract'd + wthrd (oxid. on most/all frac's)	○	○	○
	sandy/silty shale. Numer. vert. frac's. Clay throuout	○	○	○

bottom 2' of run

MW-4D

DRAFT

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	[✓ HNu]/OVA (ppm)	Comments
16											
17						3	5'			0	16.3 - 21.3'
18							100%	0%			Drills@600 psi
19											
20											
21											
22					3 min/ ft	4	1.7' 85%	0%		0	21.3-23.3' Drill@600psi
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											

DRAFT

MW-4D

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	16.3-21.3' Very heavily fract'd + wthrd fissile	○	○	○
17	sandy shale to 18' followed by v. heavily	○	○	○
18	fract'd + wthrd shaly sandstone. SS is	○	○	○
19	gradually more ~~Micaceous~~ calcareous Horiz + vert.	○	○	○
20	Fractures as well as clay w/sand soil throughout	○	○	○
21	core run.	○	○	○
22	21.3-21.9' Heavily fract'd wthrd shaly sandstone	○	○	○
23	21.9-22.3' Heavily fract'd wthrd sandy shale.	○	○	○
24	22.3-22.5' Same as 21.3-21.9'. All frac's throughout are	○	○	○
25	22.5-23.3' Same as 21.9-22.3'. oxidized.	○	○	○
26		○	○	○
27		○	○	○
28		○	○	○
29		○	○	○
30		○	○	○
31		○	○	○
32		○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
		○	○	○

D R A F T

DRILLING LOG FOR MW-5D

Project Name Wellsville - Andover Landfill

Site Location S end of S borrow pit
on E side of trees

Date Started/Finished 9-10-91 / 9-10-91

Drilling Company American Auger + Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / watercore

Bit Size (s) HQ Auger Size (s) 4¼" ID

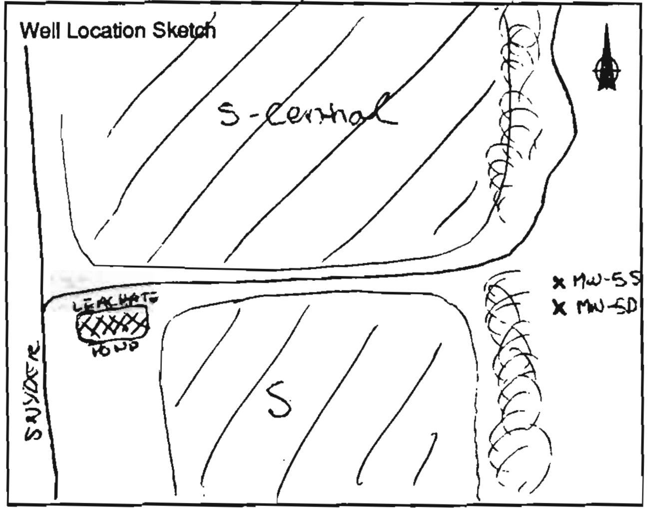
Auger/Split Spoon Refusal 23.5'

Total Depth of Borehole Is ~~36'9"~~ 23.5'

Total Depth of Corehole Is 36'9"

Water Level (TOIC)		
Date	Time	Level(Feet)
10-24-91	0820	3.30
11-20-91	13:52	3.28
2-26-92	0932	2.85

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	[✓ HNu]/OVA (ppm)	Comments
1	1	8	16								0	2.0' Rec.
2		24	18									
3	2	18	16								0	1.2' Rec. Pushed stone then retrieved bottom
4		12	12									
5	3	4	14								0	No Rec.
6		8	10									
7	4	2	5								0-2 soil	0.8' Rec.
8		16	13								0 in auger	Not enough to get sample
9	5	7	30								0-1 soil	2.0' Rec.
10		30	38								0 auger	
11	6	10	20								Slight deflection on top	1.1' Rec.
12		50 5"	x								0 in rest	
13	7	10	50 4"								0	0.7' Rec.
14		X	X								0	1.2' Rec.
	8	23	33									

DRAFT MW-5B

Stick-up 2.5 ft

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 3 ft

Borehole 8-10 inches Diameter ______ ft ______

Top of Seal at 19 ft

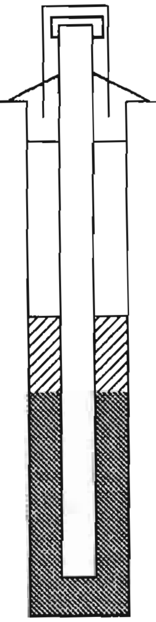
Bottom of Seal at 25

Top of Screen at 26 1/2 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 36.5 ft

SCREENED WELL



Lock Number 3252

Quantity of Material Used:

Bentonite Pellets N/A

Cement 5 bags

Cement/ Bentonite

Grout

Top of Sand Pack 25

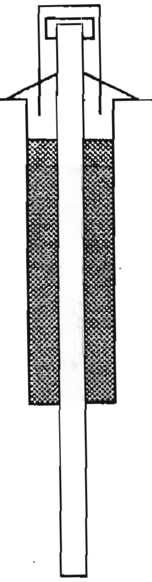
Screen Slot Size 0.010"

Screen Type
☒ PVC Sch. 40
☐ Stainless Steel

Bottom of Hole at 36.75 ft

Bottom of Sandpack at 36.75'

OPEN-HOLE WELL



Stick-up ______ ft

Inner Casing Material

Inner Casing Inside Diameter ______ Inches

Top of Grout ______ ft

Bottom of Outer Casing ______ ft

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Grout/ Casing ______ ft

Corehole Diameter

Bottom of Corehole ______ ft

NOTE: See pages 109 and 110 for well construction diagrams

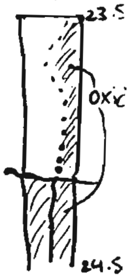
Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
1	0-1.25' Mottled grey/orng-brn clay w/ silt, sand, + gravel. Gravel	⊗	○	○
2	is subang. SS to 1/2" diam. Organics (grass + roots) to 0.5'	⊗	○	○
3	1.25-2' Orng-brn to brn gravel w/ sand, silt, + clay. Same gravel	○	⊗	○
4	to 1"	○	⊗	○
5	2-3.5' SS gravel + cobbles.	⊗	○	○
6	3.5-4' Moist mottled grey/brn clay w/ silt + sand. Clay	⊗	○	○
7	is tight + non-plastic	○	⊗	○
8	4-6' ? No recovery - pushed a cobble	○	⊗	○
9	6-6.3' SS gravel + cobbles (subang) to 1" w/ clay + sand	○	⊗	○
10	6.3-6.5' wthrd blk shale	⊗	○	○
11	6.5-6.8' Oxidized SS gravel w/ clay, silt + sand, slightly moist	⊗	○	○
12	8-8.7' Brn clay w/ silt, sand + gravel. Gravel is subrnd SS	⊗	○	○
13	to 1/2". Slightly moist.	○	⊗	○
14	8.7-10' Same but dry + structure of wthrd bedrock is intact.	⊗	○	○
	Shows wthrd ~~micaceous~~ calcareous shaly sandstone w/ minor coal	⊗	○	○

frags.

MW-5D

D R A F T

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
		50 3"	X									
16	9	50	50 5"								0	0.9' Rec.
17		x	x									
18	10	25	50								0	1.1' Rec. Making ¼ gpm
19		50 4"	x									
20	11	25	50 4"								0	0.5' Rec.
21		x	x									
22	12	40	50 3"								0	0.8' Rec. Auger @ 900 psi - hard soil
23		x	x									
24						4 min/ft @ 400psi	1	3' 100%	30%		0	23.5-26.5'
25												
26												
27							2	4.5' 92%	28%		0	
28												
29												
30												
31												
32						~4 min/ft @ 400psi	3	5' 100%	0%		0	
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												



D R A F T

MW-5D

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	10 - 11.1' Saprolitic soil of wthrd blk shale - clay w/ sand + gravel	○	⊗	○
17	sized frags of wthrd blk fissile shale. Slightly moist @ bottom	○	⊗	○
18	12 - 12.7' Same as above, but shaly sandstone gravel	○	○	⊗
19	14 - 15.2' Same as 10-11' Moist soil is oxidized	⊗	○	○
20	16 - 17' Moist highly oxidiz. SS - clay to sand. Grey where	○	⊗	○
21	wet, orng-brn where dry	error ●	○	⊗
22	18 - 18.8' Wet heavily wthrd shale saprolite.	⊗	○	error ●
23	18.8 - 19.1' Dry " " "	○	○	○
24	20 - 21' Moist heavily wthrd (oxid.) sandy shale saprolite	○	○	○
25	22 - 22.5' Wet heavily wthrd sandy shale saprolite.	○	○	○
26	22.5 - 22.7' Dry grey wthrd shale (clay "dust" w/ shale)	○	○	○
27	22.7 - 22.9' Dry orng-brn wthrd SS	○	○	○
28	23.5 - 23.9' Grey laminated fn to med.-grnd SS containing ~5% angular	○	○	○
29	black grains ~~(hornblende ?)~~	○	○	○
30	23.9 - 2$\overset{4}{3}$.2' Poorly sorted med to cs-grnd SS, white to lt grey	○	○	○
31	Contains angular shale frags as well as rnd qtz grains	○	○	○
32	24.2 - 26.5' Oxidized fn to med-grnd SS w/ interbedded	○	○	○
33	shaly sand + cs-grnd SS layers. Vert. frac. 24.1 - 25.2' +	○	○	○
34	25.9 - 26.3'. Clay + sand fill some fracs. Heavily fract'd/wthrd	○	○	○
35	from 24.9 - 25.3'.	○	○	○
36	26.5 - 27.5 ~~@~~ Grey calcareous ~~micaceous~~, very shaly/silty SS	○	○	○
37	(oxidized in top 0.3'). Frac'd w/ minor clay in fracs.	○	○	○
38	275 - 28.3' Brnish-grey (oxidized) lamin. fn-grnd SS w/ vert.	○	○	○
39	fract. (clay filled).	○	○	○
40	28.3 - 31.5' Interbedded fn-grnd SS + shale. Shale is irregular	○	○	○
41	in shape (stringers) + SS is calcareous ~~micaceous~~. Patchy	○	○	○
42	oxidation thruout. Heavily fract'd 28.2 - 28.7'.	○	○	○
43	31.5 - 32.2' Same as 28.3-31.5'	○	○	○
44	32.2 - 36' Heavily fract'd + wthrd shaly SS.	○	○	○
	36 - 36.5' Unwthrd dk grey fissile shale.	○	○	○

DRAFT

DRILLING LOG FOR MW-5S

Project Name Wellsville-Andover L.F.

Site Location Send of southern borrow pit.

Date Started/Finished 9-11-91 / 9-11-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) _____ Auger Size (s) 4 1/4" ID

Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 23'

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-24-91	0820	3.64
11-20-91	1351	3.63
2-26-92	0935	3.04

Well Location Sketch

See MW-5D

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

Stick-up ~2.5 ft

SCREENED WELL

Inner Casing Material Sch.40 PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 0 ft

Borehole Diameter 8-10 Inches ft

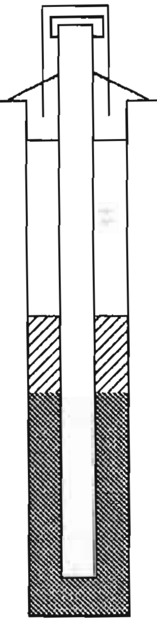
Top of Seal at 6' ft

Bottom of Seal at 8'

Top of Screen at 10 ft

Pack Type/Size:
- ☒ Sand #2 Q-Rok
- ☐ Gravel
- ☐ Natural

Bottom of Screen at 20 ft



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets

Cement

Cement/ Bentonite

Grout

Top of Sand Pack 8'

Screen Slot Size 0.010"

Screen Type
- ☒ PVC Sch.40
- ☐ Stainless Steel

Bottom of Hole at 23 ft

Bottom of Sandpack at 22

OPEN-HOLE WELL

Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter Inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
1	See log for MW-5D for lithology	○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
		○	○	○

DRILLING LOG FOR MW-6D

Project Name Wellsville-Andover LF.

Site Location W side of tree line along W side of S Fill area

Date Started/Finished 9-~~10~~11-91/9-12-91

Drilling Company American Auger + Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature Richard K. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger /core

Bit Size (s) HQ Auger Size (s) 4 1/4" ID

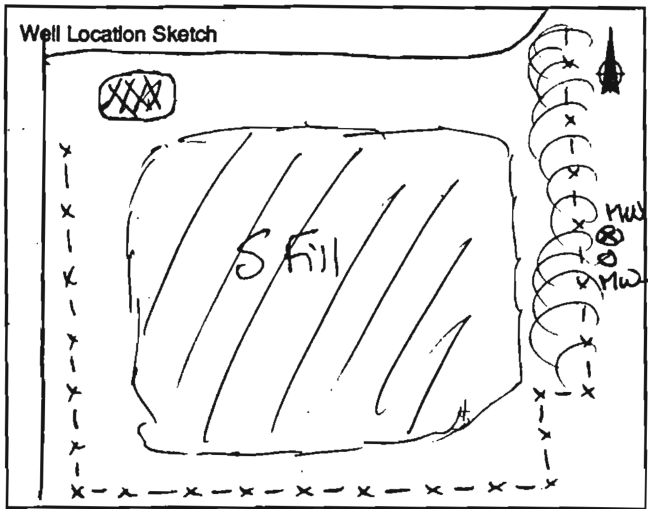
Auger/Split Spoon Refusal RW ~~14.36'~~ 14.6'

Total Depth of Borehole Is 14.6'

Total Depth of Corehole Is 28.3'

Water Level (TOIC)		
Date	Time	Level(Feet)
10-24-91	0905	18.14
11-20-91	1357	18.04
2-26-92	0923	16.97

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	[✓ HNu]/OVA (ppm)	Comments
	1	8	7									1.8' Rec.
1		15	50/5"								0	
2	2	8	30									1.6' Rec.
3		28	17								0	
4	3	36	20									0.1' Rec.
5		20	19								0	
6	4	10	10								0	1.4' Rec. Augered thru rock @ 7.5'
7		15	21									
8	5	40	26									1.8' Rec.
9		18	18								0	
10	6	15	15								0	1.6' Rec.
11		15	19									
12	7	5	7								0	1.8' Rec.
13		10	28									
14	8	10	50/4"								0	0.4' Rec.

DRAFT NRW-A2D

Stick-up 1.7 ft

SCREENED WELL

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 3 ft

Borehole Diameter 8-10 inches ft

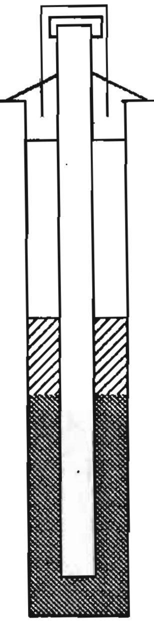
Top of Seal at 11 ft

Bottom of Seal at 16

Top of Screen at 18 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 28 ft



Lock Number 3252

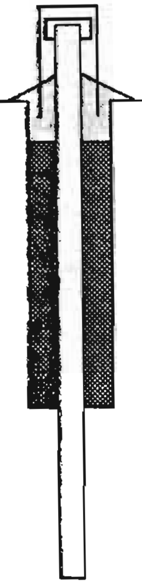
GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets N/A
Cement 3'
Cement/ Bentonite 8'
Grout
Top of Sand Pack 16
Screen Slot Size 0.010"
Screen Type
☒ PVC Sch. 40
☐ Stainless Steel

Bottom of Hole at 28.3 ft

Bottom of Sandpack at 28.3

OPEN-HOLE WELL



Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

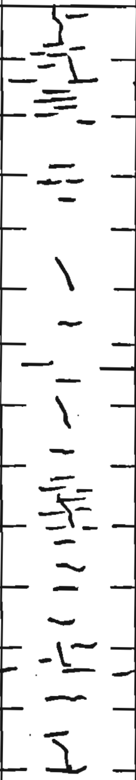
Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0-2' Light brn (minor grey mottling) sand w/ clay, silt + gravel.	⊗	○	○
2	Gravel is subrnd to subang. SS frags (oxidized).	⊗	○	○
3	2-4' Lt brn (minor grey + red mottling) clay w/ sand, gravel + silt	⊗	○	○
4	Gravel is oxidized (maroon) ang to subang SS	⊗	○	○
5	4-6' ? Pushed a cobble. Prob. SS blocked spoon,	⊗	○	○
6	Prob. same as above	⊗	○	○
7	6-8' Same as 2-4' but more tight clay. Gravel (oxid. SS)	⊗	○	○
8	to 1". SS is more shale-rich now. Hit rock @ 7.5' w/ auger	○	⊗	○
9	8-10' Same as above. Mostly dry w/ small areas of	○	⊗	○
10	wet clay	○	⊗	○
11	10-12' Same as above. SS is shale.	○	⊗	○
12	12-14' Same as above but more clay/shale-rich +	○	⊗	○
13	all moist	○	⊗	○
14	14-15' Lt brn / maroon oxidized subang. SS gravel (to 1") w/ clay,	○	⊗	○
	silt, + sand. Moist patches, remainder dry. Refusal @ 14.63'	○	⊗	○

MW-6D

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16						1	1.7' 100%	0%		0	14.6-16.3'
17											16.3-21.3'
18					2.5 min per ft @ 700 psi (2500 RPM)	2	5' 100%	34%		0	
19											
20											
21											
22								24%			21.3-26.3'
23					3.3 min per ft @ 900 psi (2200 RPM)	3	5' 100%			0	
24											
25											
26											
27					3.2 min per ft @ 900 psi	4	2' 100%	20%		0	26.3-28.3'
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											



D R A F T

MW 6D

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	~~[illegible]~~ 14.6'-16.3' Brnish grey, oxidized fn-grnd SS w/ interbedded	○	○	○
17	CS SS layers. Vert. frac's throughout, soil zone (3") @ ~15'	○	○	○
18	+ heavily fract'd/wthrd @ ~16' (4" thick)	○	○	○
19	16.3-17.3' V. Heavily fract'd/wthrd SS	○	○	○
20	17.3-18.2' Brnish grey, oxidized fn-grnd SS w/ interbdd CS SS layers.	○	○	○
21	18.2-18.7' V. Heavily Fract'd/wthrd shaley SS w/ coal "Stringers"	○	○	○
22	clay + sand seam 18.5-18.7'	○	○	○
23	18.7'-21.3' Interbedded ~~dk~~ grey fn-grnd SS/Siltstone + blk shale	○	○	○
24	21.3 - 24.4' Interbedded grey fn-grnd SS/Siltstone + blk shale	○	○	○
25	become shalier to bottom. Heavily fract'd/wthrd 23.3-24.3'	○	○	○
26	24.4-25.7' Dk grey shale w/ thin interbeds.	○	○	○
27	25.7-26.3' "~~Blocky~~ Laminated" dk grey silty shale. (Non Fissile)	○	○	○
28	26.3-28.3' Same as above. Minor blk sand grns (mafic minl)	○	○	○
29		○	○	○
30		○	○	○
31		○	○	○
32		○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
		○	○	○

D R A F T

DRILLING LOG FOR MW-6S

Project Name Wellsville-Andover L.F.

Site Location W side of S Fill area

Date Started/Finished 9-12-91 / 9-12-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) ____ Auger Size (s) 4 1/4" ID

Auger/Split Spoon Refusal 14.8'

Total Depth of Borehole Is 14.8'

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-24-91	0905	12.35
11-20-91	1358	11.69
2-26-92	0920	9.87

Well Location Sketch

See MW-6D

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

SCREENED WELL

Stick-up ~2.5 ft

Inner Casing Material Sch.40 PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 0 ft

Borehole 8-10 Inches
Diameter ______ ft

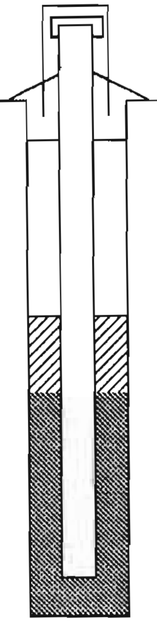
Top of Seal at 3 ft

Bottom of Seal at 5

Top of Screen at 6.5 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 13.5 ft



Lock Number ______

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets ______
Cement ______
Cement/ Bentonite ______
Grout ______

Top of Sand Pack 5

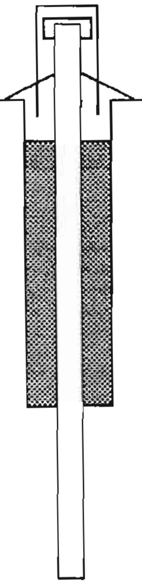
Screen Slot Size 0.010"

Screen Type ______
☒ PVC Sch.40
☐ Stainless Steel ______

Bottom of Hole at 14.8 ft

Bottom of Sandpack at 13.5

OPEN-HOLE WELL



Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ Inches

Top of Grout ______ ft

Bottom of Outer Casing ______ ft

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Grout/ Casing ______ ft

Corehole Diameter ______

Bottom of Corehole ______ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
	See log for MW-6D for lithology	○	○	○
1		○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○

DRILLING LOG FOR MW-7D

Project Name Wellsville-Andover Landfill

Site Location On LaDue Property S of site

Date Started/Finished 10-1-91 / 10-2-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / core

Bit Size (s) HQ

Auger Size (s) 4 1/4" ID

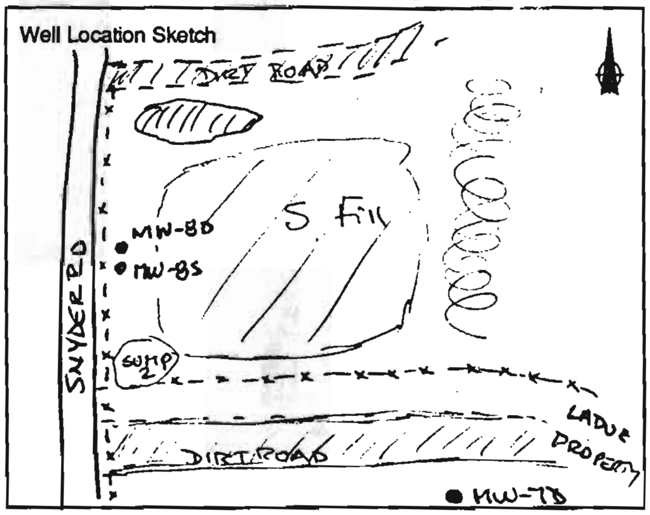
Auger/Split Spoon Refusal 26'

Total Depth of Borehole Is 26'

Total Depth of Corehole Is 45.4

Water Level (TOIC)		
Date	Time	Level(Feet)
10-23-91	1433	33.86
11-20-91	~~1433~~ 1419	33.59
2-26-92	1155	33.33

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/[✓ OVA] (ppm)	Comments
1	1	8 25	21 33								0	1.9' Rec.
2 3	2	14 49	25 35								0	1.2' Rec.
4 5	3	3 13	9 12								0	1.8' Rec.
6 7	4	8 23	22 20								0	1.2' Rec.
8 9	5	17 13	18 18								0	1.6' Rec.
10 11	6	13 32	40 13								0	1.8' Rec.
12 13	7	16 x	50 5.5" x								0	1.0' Rec.
14	8	36	36								0	1.9' Rec.

D R A F T

MW-7D

Stick-up 2.5 ft

SCREENED WELL

Inner Casing Material Sch. 40 PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 3 ft

Borehole Diameter 8-10 inches ft

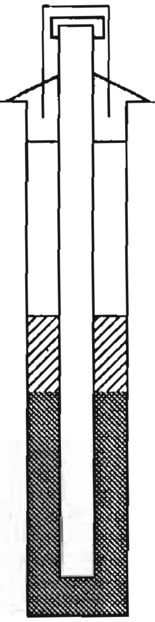
Top of Seal at 24 ft

Bottom of Seal at 31

Top of Screen at 35 ft

Pack Type/Size:
☒ Sand #3 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 45.1 ft

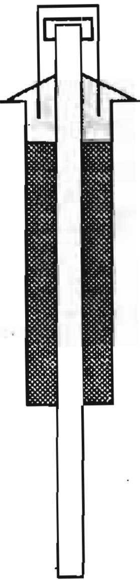


Lock Number 3252

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets N/A
Cement 3'
Cement/ Bentonite 21'
Grout –
Top of Sand Pack 31
Screen Slot Size 0.010"
Screen Type
☒ PVC Sch. 40
☐ Stainless Steel
Bottom of Hole at 45.4 ft
Bottom of Sandpack at 45.4

OPEN-HOLE WELL



Stick-up ft
Inner Casing Material
Inner Casing Inside Diameter Inches
Top of Grout ft
Bottom of Outer Casing ft
Borehole Diameter ft
Bedrock ft
Bottom of Rock Socket/ Grout/ Casing ft
Corehole Diameter
Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0-0.4' Dk brown organic rich silt w/ clay + sand (topsoil)	⊗	○	○
2	0.4-2' Grey, wthrd SS gravel in a matrix of brown sand w/ minor clay	⊗	○	○
3	2-4' Brown clayey sand w/ silt + SS gravel to 1/2". SS	⊗	○	○
4	cobble in end of spoon.	⊗	○	○
5	4-4.5' Light brown sandy silt	⊗	○	○
6	4.5-6' Med. brn sandy clay w/ gravel + silt. Sand is fn to cs-	○	⊗	○
7	grained. Cs sand / gravel is angular ~~[illegible]~~ calcareous SS. Very slight moist.	⊗	○	○
8	6-8' Same as above	⊗	○	○
9	8-10' Same as above	⊗	○	○
10	10-10.5' SS gravel w/ sand + clay (wthrd in place) - dry	⊗	○	○
11	10.5-11.2' Med. brn sandy clay w/ silt + gravel Sand is ~~[illegible]~~ calcareous	⊗	○	○
12	(very slight moisture)	⊗	○	○
13	11.2-11.5' Same as 10-10.5'	⊗	○	○
14	11.5-12' Same as 10.5-11.2'	⊗	○	○
	12-13' Same as above 13-14' ?	⊗	○	○

D R A F T

MW-7D

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/[✓ OVA] (ppm)	Comments
		36	50 5"									
16	9	12	20								0	1.8' Rec.
17		20	30									
18	10	16	26								0	2.0' Rec.
19		35	36									
20	11	30	50 5½"								0	0.9' Rec.
21		x	x									
22	12	25	50 5"								0	0.6' Rec.
23		x	x									
24	13	49	50 5"								0	0.9' Rec.
25		x	x									
26	14	50 4"	x				1	4.3' 100%	15%		0	26-30.3'
27		x	x									
28												
29												
30												30.3-35.3'
31							2	5' 100%	24%		0	
32												
33												
34												
35												35.3-40.3'
36							3	4.7' 96%	32%		0	
37						3 min/ft @400 psi						
38												
39												
40												40.3-45.3'
41							4	5' 100%	15%			
42						3 min/ft @ 400 psi					0	
43												
44												

D R A F T

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	14-14.5' Same as above	⊗	○	○
17	14.5-14.8' Grey SS cobbles (wthrd in place) dry	⊗	○	○
18	14.8-16' Same as 14-14.5' (very slight moisture)	⊗	○	○
19	16-18' Same as above	⊗	○	○
20	18-20' Same as above w/ shale gravel in addition to SS in	⊗	○	○
21	last 4"	⊗	○	○
22	20-21' Light brn sandy clay w/ silt (dry)	⊗	○	○
23	21-22' ?	⊗	○	○
24	22-23' Light brn sandy clay w/ silt + gravel (dry)	⊗	○	○
25	23-24' ?	⊗	○	○
26	24-24.6' Same as 22-23'	⊗	○	○
27	24.6-24.9' Red, wthrd/oxidiz. med-grnd SS	○	○	○
28	25-26' ?	○	○	○
29	26-26.3' wthrd/oxid. grey + red SS	○	○	○
30	26-30.3' wthrd brown (grey where fresh surface) fine-grnd,	○	○	○
31	laminated, fossiliferous (brachs) SS. Becomes shaley	○	○	○
32	SS/siltstone from 28-30'. Numerous horiz + vert.	○	○	○
33	frac's from 27.4' down.	○	○	○
34	30.3-35.3' Interbedded fn-grnd laminated SS and	○	○	○
35	laminated shaley SS/siltstone. Mostly oxidized orng-	○	○	○
36	brn, with some fresh grey areas. Numerous horiz. +	○	○	○
37	vert. frac's. Heavily fract'd from 35.9-37.9'	○	○	○
38	35.3-36.1' Laminated shaley fn-grnd SS, red-brn where	○	○	○
39	oxid. w/ minor grey fresh-surfaces. Numerous horiz. + vert fracs.	○	○	○
40	36.1-36.5' Laminated fine-grnd SS - otherwise same as above.	○	○	○
41	36.5-39.5' Dk grey sandy/silty shale w/ oxidized horiz.	○	○	○
42	fracs.	○	○	○
43	39.5-40.3' Red-maroon fn to cs-grnd-SS. Grades down from	○	○	○
44	grey shale to red. SS. one horiz. oxid. frac. cs grains	○	○	○
	are rounded qtz.	○	○	○

D R A F T

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION MW-7D	Moisture Content Dry	Moist	Wet
46	40.3 - 40.8 Red, poorly sorted, fn to cs grnd SS, w/ subround	○	○	○
47	qtz cs grains	○	○	○
48	40.8-40.9 Black shale.	○	○	○
49	40.9-41.1' Same as 40.3-40.8'	○	○	○
50	41.1-45.3' Interbedded grey fn grnd SS, shaly SS, + dk grey	○	○	○
51	shale. Oxidiz. from 42.6-44.3' + heavily fract'd.	○	○	○
52	from 42.6-43.3'. Vert. frac. @ 41.1-41.5'. Bottom 0.6'	○	○	○
53	is dk grey shale w/ irregular interbeds of grey SS.	○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75		○	○	○
		○	○	○

D R A F T

DRILLING LOG FOR MW-8D

Project Name Wellsville-Andover Landfill

Site Location W side of S fill area, adjacent to Snyder Rd.

Date Started/Finished 9-20-91 / 9-30-91

Drilling Company American Auger

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R Watts

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / core

Bit Size (s) HQ Auger Size (s) 4 1/4" ID

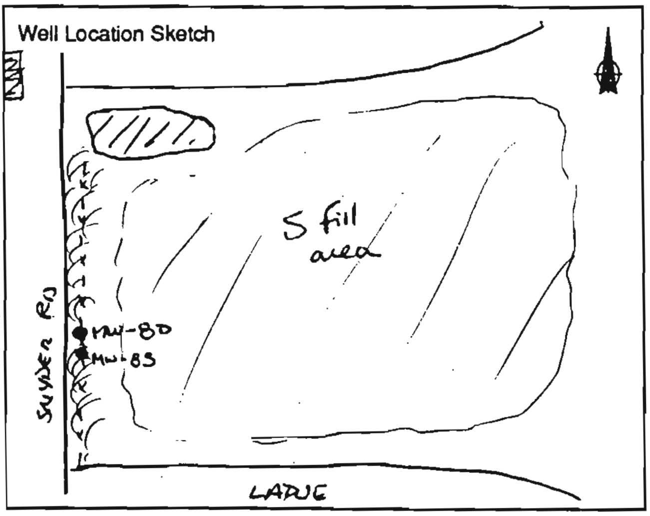
Auger/Split Spoon Refusal ~~MW-8S~~ ~~64.5'~~ RW 64'

Total Depth of Borehole Is ~~64.5~~ 64'

Total Depth of Corehole Is 78'

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/[✓ OVA] (ppm)	Comments
1	1	11	17								0	1.9' Rec.
2		12	20									
3	2	22	23								0	1.1' Rec.
4		50 6"	x									
5	3	19	19								0 in hole + on cuttings	0 Rec. Prob. pushed a stone
6		20	23									
7	4	16	17								0	1.1' Rec extra S. spoon for sample recov.
8		16	24									
9	5	12	12								0	2' Rec.
10		12	13									
11	6	6	7								0	2' Rec.
12		9	12									
13	7	8	8								0	1.4' Rec.
14		8	16									
	8	3	5								0	1.2' Rec.

D R A F T 10/9/91 10' open 25'/4/91

ABANDONED @ 2-27-92

SCREENED WELL

OPEN-HOLE WELL

Stick-up 2.5 ft

Inner Casing Material PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 3 ft

Borehole 10 Inches Diameter ___ ft ___

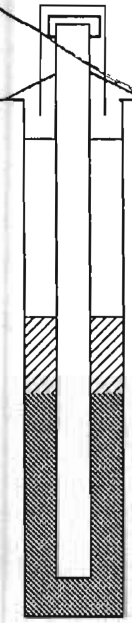
Top of Seal at 57 ft

Bottom of Seal at 65.5'

Top of Screen at 67 ft

Pack Type/Size:
☒ Sand #2Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 77.0' ft



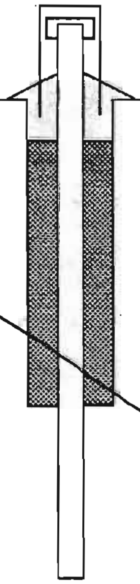
Lock Number 3252

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets NA
Cement ~~#~~ 3'
Cement/ Bentonite 54'
Grout
Top of Sand Pack 65.5'
Screen Slot Size 0.010"
Screen Type
☒ PVC SCH.40
☐ Stainless Steel

Bottom of Hole at 77.0' ft

Bottom of Sandpack at 77.0'



Stick-up ___ ft

Inner Casing Material ___

Inner Casing Inside Diameter ___ Inches

Top of Grout ___ ft

Bottom of Outer Casing ___ ft

Borehole Diameter ___ ft

Bedrock ___ ft

Bottom of Rock Socket/ Grout/ Casing ___ ft

Corehole Diameter ___

Bottom of Corehole ___ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0-0.2' Dk brn, organic rich silty sand topsoil	☒	○	○
2	0.2-2' Mottled lt grey/orng-brn sandy silt w/ gravel + minor clay.	☒	○	○
3	2-3.1' Mottled grey/brn sandy silt w/ gravel + clay. Tight but	☒	○	○
4	noncohesive Gravel is angular SS w/ some ang. shale	☒	○	○
5	4-6' ? Auger cuttings indicate same as above w/ increased	☒	○	○
6	gravel content. %-ages now indicate gravelly sand w/ clay + silt Rock layer @ 5'	☒	○	○
7	6-7.1' Slightly moist brn gravelly sand w/ clay + silt. Shaley SS	○	☒	○
8	layer @ ~6', Cuttings indicate cobbles of shaley SS @ ~7.58'	○	☒	○
9	8-10' Brn gravelly clay w/ sand + silt; slightly moist;	○	☒	○
10	Tight.	○	☒	○
11	10-12' Same as above.	○	☒	○
12	12-14' Same as above w/ SS cobbles @ 12' + 13.5'. Slightly	○	☒	○
13	Moist.	○	☒	○
14	14-16' Same as above	○	☒	○
		○	○	○

D R A F T

MW-8

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
		7	12									
16	9	8	14								0	0.6' Rec. Cobble in end of spoon
17		10	21									OUTSIDE OF SPOON IS WET
18	10	6	17								0	0.4' Rec. pushed cobble
19		15	15									outside of spoon is wet.
20	11	6	9								0	No Rec. pushed cobble
21		9	13									Took 2nd spoon to see
22	12	5	5								0-0.2	1.5' Rec.
23		5	14									
24	13	8	10								0	2' Rec.
25		14	21									
26	14	12	12								0	1.8' Rec.
27		16	20									
28	15	16	50 4"								0	0.4' Rec.
29		x	x									
30	16	10	15								0	1.8' Rec
31		25	23									
32	17	16	20								0	1.7' Rec.
33		23	29									
34	18	12	30								0	1.2' Rec.
35		23	28									
36	19	15	20								0 - [illegible]	1.7' Rec.
37		49	41									
38	20	25	25			0.1'/min @ 1200 psi.					0-0.2	2' Rec Augers very
39		25	30									
40	21	18	30								10 OVA 0 HNu	0.2' Rec.
41		39	38								dissipates quickly	Not enough to sample 0 OVA on cuttings
42	22	20	23								0	2' Rec.
43		21	37									
44	23	10	20								0	0.3' Rec.

DRAFT

MW-8D

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16	16 - 16.6' Same as above.	○	☒	○
17	18-18.4' Same as above	○	☒	○
18	20-22' Same as above but very moist - clay content	○	☒	○
19	increased. - Gravelly clayey sand w/ silt	○	☒	○
20	22-24' Greeyish-brn sandy clay w/ silt + gravel. Gravel in	○	☒	○
21	occaiss. SS frag. Moist. Less gravel than above + more	○	○	☒
22	rnd (subrnd to subang).	○	○	☒
23	24-26' Same as above, but gravel also consists of	○	☒	○
24	shale frag 1"x 1/2" x 1/16". Top 6" is saturated	○	☒	○
25	from sitting in auger bit, rest is wet.	○	○	☒
26	26-28' Similar to above but more silt + clay +	○	○	☒
27	less gravel + sand - greyish brn silty clay	○	☒	○
28	w/ sand + gravel	○	☒	○
29	28-28'10" Same as above	○	☒	○
30	Auger cuttings since 24' have been saturated.	○	○	○
31	30-32' Similar to above, but high gravel content -	○	○	☒
32	gravelly clay w/ silt + sand. Wet @ top - only	○	☒	○
33	slightly moist @ bottom.	○	☒	○
34	32-34' Same as above w/ inc. sand content - gravelly sandy	○	☒	○
35	clay w/ silt	○	☒	○
36	34-36' Same as above, only slightly moist.	○	☒	○
37	36-38' Same as above w/ SS cobble + rnd med-grnd sand	○	☒	○
38	@ bottom - Sand is oxidized maroon qtz.	○	☒	○
39	38-40' Same as above w/ wthrd maroon (sand +) sandstone	○	☒	○
40	@ 38.5-38.8' - ~~[illegible]~~	○	☒	○
41	40-42' ? Pushed a maroon SS cobble (heavily wthrd)	○	☒	○
42	42-44' same as above w/ gravel also consisting of shaly	○	☒	○
43	SS + ~~micaceous~~ calcareous SS. SS layer 42.3-42.6' (brn to	○	☒	○
44	grey, wthrd, not oxidized).	○	☒	○
	44-44.3' SS cobbles. - pushed one - poor recovery	○	☒	○

DRAFT

MW-D

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
		31	30									
46	24	25	40								0	2' Rec
47		40	50 4"									
48	25	12	13								0	1.2' Rec.
49		40	49									
50	26	13	40								0	1.3' Rec.
51		38	38									
52	27	11	15								0	1.3' Rec.
53		22	31									
54	28	7	8								0	1.1' Rec.
55		15	49									
56	29	8	12								0	0.9' Rec
57		50 4"	x									
58	30	12	22								0	0.5' Rec.
59		40	50 4"									
60	31	6	23								0	0.7' Rec.
61		50 3"	x									
62	32	7	18								0	0.9' Rec.
63		50 5"	x									
64	33	6	40								0	0.8' Rec.
65		50 1"	x				1	100%	40%		0	64.5 - 66'
67						2.7 min per ft @ 600 psi	2	5' 100%	83%		0	66 - 71'
68												
69												
70												
71						3 min per ft @ 700 psi	3	5' 100%	19%		0	71 - 76'
72												
73												
74												
75												

D R A F T

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION MW-80	Moisture Content Dry	Moist	Wet
	~~Top~~ 46 48' Greyish brown silty clay w/ silt + occasional	○	○	⊗
46	gravel of wthrd SS. Top 4" is coarse sand, prob.	○	⊗	○
47	from auger bit. Top 1.5' is saturated from overlying	○	⊗	○
48	water, rest is MOIST.	○	⊗	○
49	48-49' Same as above.	○	⊗	○
50	49-50' Sandy clay w/ gravel mottled greenish-grey	○	⊗	○
51	+ pinkish grey. Contains shaly calcareous ~~micaceous~~	○	⊗	○
52	SS gravel (greenish grey) w/ 1 mm coal @ bottom	○	⊗	○
53	50-52' Same as above not mottled grey / Lt brn (no coal)	○	⊗	○
54	52-54' Same as 49-50' w/ top 4" consisting of wthrd	○	⊗	○
55	SS cobbles + 1 conglomerate cobble.	○	⊗	○
56	54-56' Same as above w/ wthrd fossiliferous (brachs)	○	⊗	○
57	SS cobbles @ bottom.	○	⊗	○
58	56-57.3' Same as above but w/ bottom 3"-4" brn	○	⊗	○
59	heavily wthrd calcareous ~~micaceous~~ SS, structure intact.	○	⊗	○
60	58-60' Same as last 3" of above.	○	⊗	○
61	60-61.3' Same as above	○	⊗	○
62	62-63.4' Same as above w/ slightly more clay rich	○	⊗	○
63	Matrix	○	⊗	○
64	64-65' Same as above. Auger refusal @ 64.5'	○	⊗	○
65	64.5-65' Wthrd (oxid) brn laminated fn-grnd SS	○	⊗	○
67	65-65.1 Irregular interbeds of blk shale w/ grey SS	○	○	○
68	65.1-66' Same as 64.5-65'. Soil layer @ 65.1'	○	○	○
69	66-71' Lt grey fn-grnd laminated sandstone w/	○	○	○
70	occasional interbeds of blk CaCO3 ~~mica~~-rich shale.	○	○	○
71	Oxidized brn from 66-66.7', 68-68.3', 69', 69.4-69.8',	○	○	○
72	+ @ 71'.	○	○	○
73	71-74.4' Lt grey fn-grnd SS w/ irreg blk shale interbeds	○	○	○
74	Blk shale clasts @ 71.7-71.9'. Brn oxidation @ 71.6', 72.5',	○	○	○
75	+ 74.4'.	○	○	○

MW-8D

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77						4	2' 100%	27.5'		0	76-78'
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

D R A F T

MW-8D

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
77	74.4-76' Blk shale w/ irreg. interbeds of lt grey SS.	○	○	○
78	Heavily wthrd/oxidized from 75.6-76' w/ vert fract.	○	○	○
79	76-78' Same as above w/ heavily wthrd/fract'd zones	○	○	○
80	@ 76-76.3' + 77.5-77.9'	○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○
		○	○	○

DRAFT

DRILLING LOG FOR MW-8D (redrill)

Project Name Wellsville-Andover L.F.

Site Location W side of S fill area, adjacent to Snyder Rd.

Date Started/Finished 2-26-92/2-27-92

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / water coring

Bit Size (s) HQ Auger Size (s) 4¼" ID

Auger/Split Spoon Refusal 55'

Total Depth of Borehole Is 55'

Total Depth of Corehole Is 71'

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

See original MW-8D

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

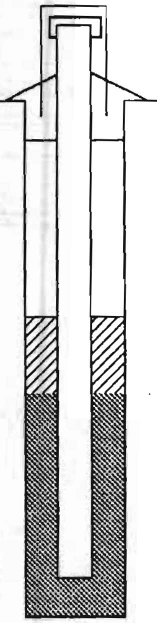
MW-8D (redr) DRAFT

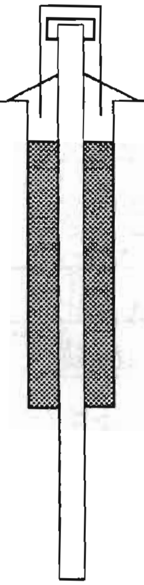
Stick-up ~2.5 ft

Inner Casing Material Sch.40 PVC

Inner Casing Inside Diameter 2 inches

Lock Number 3252





Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ inches

Top of Grout 0 ft

Borehole Diameter 8-10 inches ______ ft ______

Top of Seal at 35 ft

Bottom of Seal at 58'

Top of Screen at 61 ft

Pack Type/Size:
☐ Sand ______
☐ Gravel ______
☐ Natural ______

Bottom of Screen at 71 ft

Quantity of Material Used:
Bentonite Pellets ______
Cement ______
Cement/ Bentonite ______
Grout ______

Top of Sand Pack 58'

Screen Slot Size 0.010"

Screen Type ______
☐ PVC ______
☒ Stainless Steel 304

Bottom of Hole at 71.3' ft

Bottom of Sandpack at 71.3'

Top of Grout ______ ft

Bottom of Outer Casing ______ ft

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Grout/ Casing ______ ft

Corehole Diameter ______

Bottom of Corehole ______ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	see log for original MW-8D (now abandoned)	○	○	○
2	for lithologic description .	○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
		○	○	○

D R A F T

DRILLING LOG FOR MW-8S

Project Name Wellsville - Andover L.F.

Site Location W side of S Fill area, adjacent to Snyder Rd.

Date Started/Finished 9-30-91 / 10-1-92

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) ____ Auger Size (s) 4¼" ID

Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 20.7'

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1140	9.27
11-20-91	1411	9.12
2-26-92	1245	8.22

Well Location Sketch

See MW-8D

Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												

DRAFT MW 8S

Stick-up ~2.5 ft

Inner Casing Material sch 40 PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 0 ft

Borehole 8-10 Inches Diameter ____ ft

Top of Seal at 3.5 ft

Bottom of Seal at 5.5'

Top of Screen at 7 ft

Pack Type/Size:

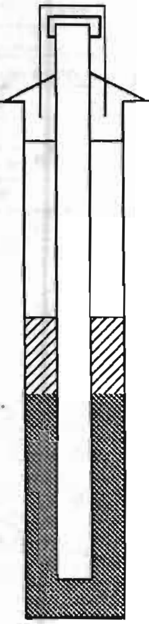
☒ Sand #2 Q-Rok

☐ Gravel

☐ Natural

Bottom of Screen at 17 ft

SCREENED WELL



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets

Cement

Cement/ Bentonite

Grout

Top of Sand Pack 5.5'

Screen Slot Size 0.010"

Screen Type

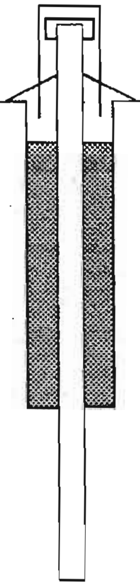
☒ PVC sch. 40

☐ Stainless Steel

Bottom of Hole at 20.7 ft

Bottom of Sandpack at 20.7'

OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material

Inner Casing Inside Diameter ____ Inches

Top of Grout ____ ft

Bottom of Outer Casing ____ ft

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Grout/ Casing ____ ft

Corehole Diameter

Bottom of Corehole ____ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
	see log for MW-8D for lithology.	○	○	○
1		○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○

D R A F T

DRILLING LOG FOR MW-9D

Project Name Wellsville-Andover Landfill

Site Location N of site access road near N access ~~road~~ gate

Date Started/Finished 9-18-91/9-19-91

Drilling Company American Auger + Ditching Co.

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / core (water)

Bit Size (s) HQ Auger Size (s) 4 1/4" ID

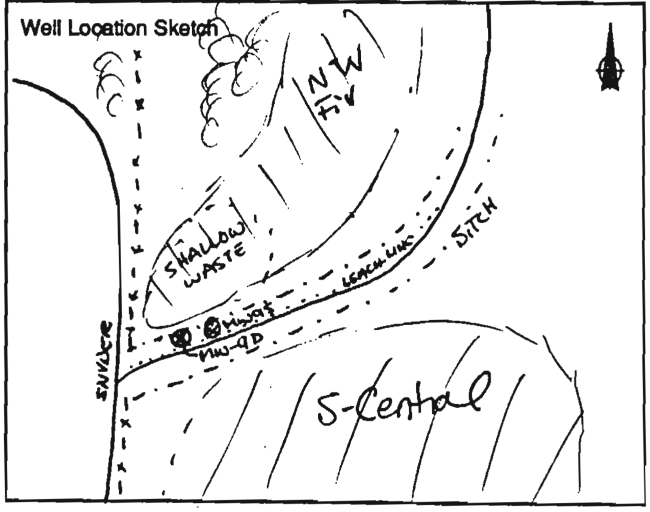
Auger/Split Spoon Refusal 29'

Total Depth of Borehole Is 29'

Total Depth of Corehole Is 45.4'

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1121	~~29.78~~ 28.17
11-20-91	1255	29.78
2-26-92	1100	29.76

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
	1	16	18								0/0	1.7' Rec.
1		18	23									
2	2	24	32								0/0	1.2' Rec.
3		29	26									
4	3	18	17								0/0	1.8' Rec.
5		22	15									
6	4	10	12								0/0	1.4' Rec.
7		13	12									
8	5	~~5~~ 10	7								0/0	0.9' Rec.
9		11	30									
10	6	16	24								0/0	1.5' Rec.
11		16	25									
12	7	26	21								0.4 OVA 0 HNu	1.4' Rec. Not enough to sample fro'
13		20	21									
14	8	10	10								0/0	1.6' Rec.

D R A F T

MW-9D

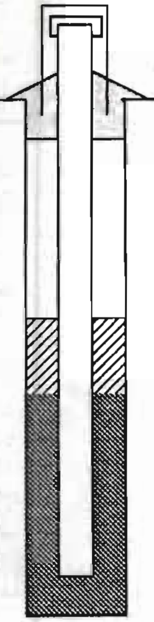
Stick-up 2.5 ft

SCREENED WELL

Inner Casing Material Sch. 40 PVC

Inner Casing Inside Diameter 2 Inches

Lock Number 3252



GROUND SURFACE

Top of Grout 0 ft

Borehole Diameter 8-10 Inches ____ ft

Top of Seal at 26 ft

Bottom of Seal at 32

Top of Screen at 35.1 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

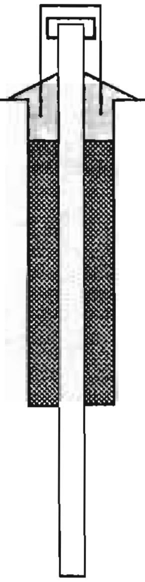
Bottom of Screen at 45.1 ft

Quantity of Material Used:
Bentonite Pellets N/A
Cement 3'
Cement/ Bentonite 23'
Grout
Top of Sand Pack 32
Screen Slot Size 0.010"
Screen Type Sch. 40
☒ PVC 10'
☐ Stainless Steel

Bottom of Hole at 45.4 ft

Bottom of Sandpack at 45.4

OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material ____

Inner Casing Inside Diameter ____ Inches

Top of Grout ____ ft

Bottom of Outer Casing ____ ft

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Grout/ Casing ____ ft

Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	0-0.3' Dark brown organic rich silt w/ sand + clay	⊗	○	○
2	0.3-0.4' Gravel (from road)	⊗	○	○
3	0.4-4' Brown sandy clay w/ silt + gravel - tight, dry. Occaiss	⊗	○	○
4	gravel to 1.5" of ang. SS + subrnd qtz + SS to 1/4"	⊗	○	○
5	4-6' Same as above.	⊗	○	○
6	6-8' Same as above but contains orng + maroon sands from	⊗	○	○
7	oxidized SS. Very Sligtly Moist.	○	⊗	○
8	8-9' Same as above + very slightly moist.	○	⊗	○
9	10-10.8' Angular wthrd SS frag to 1.5"	○	⊗	○
10	10.9-12' Same as 8-9'	○	⊗	○
11	12-12.9' Angular wthrd SS frag to 1.5"	⊗	○	○
12	12.9-14' Same as 8-9' but increased gravel %-age + size.	○	⊗	○
13	14-16' Same as immed. above but gravel also now consists of	⊗	○	○
14	wthrd shale frag.	○	⊗	○
		○	⊗	○

DRAFT

MW-9D

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
		15	19									
16	9	6	10								0/0	1.6' Rec.
17		15	29									
18	10	8	15								0/0	0.8' Rec.
19		10	20									
20	11	9	10								0/0	1.3' Rec.
21		12	15									
22	12	6	15								0/0	1.0' Rec
23		18	20									
24	13	10	12								0/0	1.2' Rec
25		20	20									
26	14	11	26								0/0	1.4' Rec.
27		40	50 3"									
28	15	25	41								0/0	1.0' Rec. Ref. @ 29'
29		50 0"	x				1	1.9' 100%	0%		0/0	29-30.9'
30												
31												30.9-35.95'
32						4min for bottom ft@ 800 psi (could got wh circulate	2	4' 86%	25%		0/0	
33												
34												
35												
36						4min/ft @ 750psi	3	5' 100%	0%		1 OVA	35.5-40.5'
37											0 HNu	
38												
39												
40												
41												
42												
43												
44												

DRAFT

MW-9D

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16	16-18' Same as immed. above but no shale	○	⊗	○
17	18 - 18.5' wthrd angular SS frags in sand matrix, wthrd	○	⊗	○
18	Maroon @ 18.5'	○	⊗	○
19	18.5 - 18.8' Same as 16-18'	⊗	○	○
20	20-22' Same as above w/ one large shaly SS frag 2" long x 1"	○	⊗	○
21	22-23' Same as above	○	⊗	○
22	24-26' Same as above	○	⊗	○
23	26-27.5' Lt brown gravelly sand w/ clay + silt - wthrd sandy	○	⊗	○
24	shale bedrock - gravel is shale frags + matrix	○	⊗	○
25	still has bedrock structure intact. Dry	⊗	○	○
26	28-29' Dk brn gravelly sandy clay w/ silt. Gravel is large (1.5")	⊗	○	○
27	SS frags.	○	○	○
28	29-30.9' Heavily wthrd (oxidized) + fractured SS (~~micaceous~~ calcareous) rw	○	○	○
29	Except @ bottom is oxid. conglomerate w/ fine gravel of	○	○	○
30	rnd qtz. Numerous vert. + horiz. clay-filled frac's.	○	○	○
31	30.9-35.5' Heavily fract'd + wthrd shaly fn-grnd SS.	○	○	○
32	Numerous horiz. + vert. fract's, many clay filled.	○	○	○
33	35.5-40.5' Very heavily wthrd/fract'd SS - really	○	○	○
34	almost soil + not rock - many soil zones, many	○	○	○
35	rock zones which can be crushed w/ fingers.	○	○	○
36	Horiz. + vert. frac's.	○	○	○
37	40.5-45.5' Same as above but what rock exists is	○	○	○
38	very shaley siltstone/fn grd SS or sandy/silty shale	○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
		○	○	○

DRILLING LOG FOR MW-9S

Project Name Wellsville-Andover L.F.

Site Location Near N access gate

Date Started/Finished 9-19-91 / 9-19-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) ______ Auger Size (s) 4 1/4" ID

Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 19.3'

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1121	20.29
11-20-91	1256	17.35
2-26-92	1056	10.99

Well Location Sketch

See MW-9D

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

MW-9S DRAFT

Stick-up ~2.5 ft

Inner Casing Material sch.40 PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 0 ft

Borehole 8-10 Inches
Diameter ____ ft

Top of Seal at 5 ft

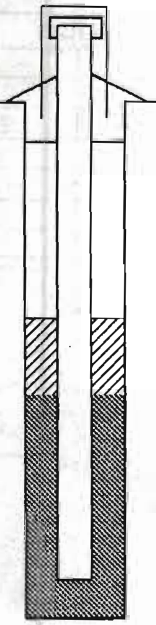
Bottom of Seal at 7'

Top of Screen at 9 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 19' ft

SCREENED WELL



GROUND SURFACE

Lock Number ______

Quantity of Material Used:
Bentonite Pellets ______
Cement ______
Cement/ Bentonite ______
Grout ______

Top of Sand Pack 7'

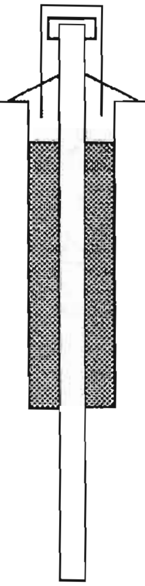
Screen Slot Size 0.010"

Screen Type ______
☒ PVC sch. 40
☐ Stainless Steel ______

Bottom of Hole at 19.3 ft

Bottom of Sandpack at 19.3

OPEN-HOLE WELL



Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ Inches

Top of Grout ______ ft

Bottom of Outer Casing ______ ft

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Grout/ Casing ______ ft

Corehole Diameter ______

Bottom of Corehole ______ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	See log for MW-9D for lithology	○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
		○	○	○

DRILLING LOG FOR MW-~~[illegible]~~10D

Project Name Wellsville - Andover Landfill

Site Location W side of ~~[illegible]~~ NW fill area on W side of ditch + "alleyway"

Date Started/Finished 9-13-91 / 9-17-91

Drilling Company American Auger + Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger / Core (water)

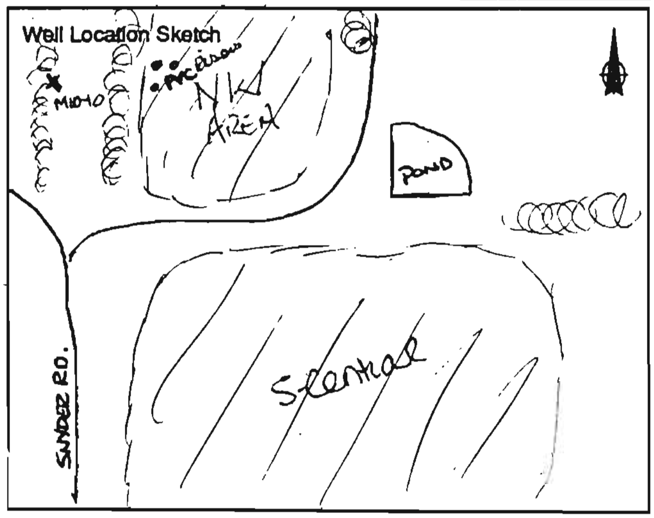
Bit Size (s) HQ Auger Size (s) 4 1/4' ID

Auger/Split Spoon Refusal 29'

Total Depth of Borehole is 29'

Total Depth of Corehole is 43.4'

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1357	23.47
11-20-91	1306	25.41
2-26-92	1111	23.66



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1 2	1	2 10	6 18								0/0	1.6' Rec.
3 4	2	17 17	14 20								0/0	1.6' Rec.
5 6	3	6 12	8 19								0/0	1.2' Rec.
7 8	4	20 32	26 28								0-2 OVA 0 HNu	1.2' Rec.
9 10	5	6 10	9 16								0/0	1.3' Rec
11 12	6	7 16	12 25								0/0	1.7' Rec.
13 14	7	4 9	5 13								0/0	1.4' Rec.
	8	6	7									

DRAFT

MW-10D

Stick-up 2.3 ft

Inner Casing Material sch 40 PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 0 ft

Borehole Diameter 8-10 inches ft

Top of Seal at 26 ft

Bottom of Seal at 31

Top of Screen at 33.1 ft

Pack Type/Size:

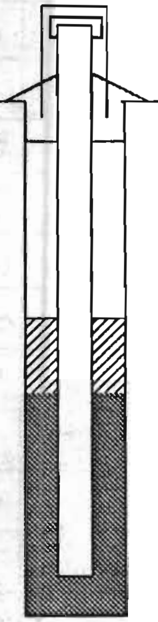
☒ Sand #3 Q-Rok

☐ Gravel

☐ Natural

Bottom of Screen at 43.1 ft

SCREENED WELL



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets N/A

Cement

Cement/Bentonite 23' (Benseal/Cement)

Grout

Top of Sand Pack 31

Screen Slot Size 0.010"

Screen Type

☒ PVC sch. 40

☐ Stainless Steel

Bottom of Hole at 43.4 ft

Bottom of Sandpack at 43.~~3~~4' rw

OPEN-HOLE WELL

Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter Inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moisture Content Moist	Moisture Content Wet
1	0-0.5' Dk brn silt w/ sand + organics (grass/roots)	⊗	○	○
2	0.5-1.6' Mottled lt grey/orng-brn silty sand w/ clay + one 1"	⊗	○	○
3	SS frag (subang)	⊗	○	○
4	2-3.2' Same as immed. above but %age cs sand + gravel incr.	⊗	○	○
5	down. Also orng-brn grades down to med. brn.	⊗	○	○
6	3.2-3.6' Brown sand w/ clay, silt + gravel. CS sand + gravel is	⊗	○	○
7	oxidized SS frags to 1/4"	○	⊗	○
8	4-4.5' Same as immed. above.	○	⊗	○
9	4.5-4.7' Competent SS layer. Greyish brown, wthrd	○	⊗	○
10	4.7-5.2' Med. brown clayey sand w/ silt Mottled w/ grey clay	○	⊗	○
11	6-6.5' Brown gravelly sand w/ silt + clay, slightly moist	○	⊗	○
12	6.5-7.3' Competent grey SS layer w/ SS gravel + minor silt + sand	○	⊗	○
13	8-10' Moist, primarily olive-brn ~~micaceous~~ calcareous sand w/ silt + clay	○	⊗	○
14	+ minor gravel. Mottled w/ some grey clayey sand	○	⊗	○
	10-12' Moist olive-brn micaceous clayey gravelly sand w/ silt	○	○	○

Mottled w/ blk, grey, red, + maroon next to SS frags of same color.

DRAFT

MW-10D

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
15–16		7 10								0/0	1.8' Rec.
16–18	9	5 10 10 17								0/0	1.0' Rec.
18–20	10	8 14 16 20								3 OVA 0 HNu	1.8' Rec.
20–22	11	25 25 20 40								1 OVA 0 HNu	0.8' Rec.
22–24	12	13 50/3" x x								0/0	0.3' Rec. outside of spoon is wet.
24–26	13	10 26 20 30								0/0	1.6' Rec. outside of spoon is wet
26–28	14	15 15 13 18								<1/2 OVA 0 HNu	1.2' Rec
28–30	15	10 50/6" x x								0/0	0.8' Rec. ~10' of hammer is wet
29–31.2					2 min/ft @ 500 psi	1	2.2' 100%	0%		0/0	29-31.2'
31.2–36.2						2	5' 100%	56%		0/0	31.2-36.2'
36.2–41.2					3 to min/ Ft @ 800 psi	3	5' 100%	27%		0/0	36.2-41.2'
41.2–43.2						4	2' 100%	50%		0/6	41.2-43.2'

DRAFT

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION , MW-10D	Moisture Content Dry	Moist	Wet
16	12-14' Moist olive-brn gravelly clay w/ sand + silt. Gravel is subrnd	○	☒	○
17	shale + ss frags to 1/4"	○	☒	○
18	14-16' Same as above w/ one ss frag to 1" + one oxidiz. conglom.	○	☒	○
19	frag to 1". Bottom 5-6" is same color but no gravel -	○	☒	○
20	~~Mica~~ $CaCO_3$-rich sandy clay w/ silt	○	☒	○
21	16-18(?)' Limited recovery due to pushing + subsequent	○	☒	○
22	rec. of 1.5" SS cobble. Recov. is same as above w/gravel	○	☒	○
23	18-18.5' Same as above	○	☒	○
24	18.5-20' Bluish grey wthrd ~~Micaceous~~ calcareous shale / clay	○	☒	○
25	20-21' Same as above. Fissile sandy ~~Micaceous~~ calcareous shale frags in	○	○	☒
26	clay matrix. Slightly Moist	○	○	☒
27	22-22.7' wthrd shale, slightly moist	☒	○	○
28	24-26' Same as above but wet. Soil would be classif. as gravelly clay	☒	○	○
29	26-28' Same as above but dry.	○	○	☒
30	28-29' Wet clayey gravel w/ sand - gravel is shaly SS	○	○	☒
31	29-31.2 Grey ~~micaceous~~ calcareous laminated fine-grnd SS. Appears lamin'd	○	○	○
32	w/ shale. Minor oxidation on fracture surfaces	○	○	○
33	31.2 - 33.7' Competent Laminated grey/blk fn-grd, ~~micaceous~~ calcareous SS	○	○	○
34	33.7-33.9' Heavily wthrd, oxidiz. zone of same	○	○	○
35	33.9 - 34.1' Dk grey SS w/ coal "stringers")	○	○	○
36	34.1 - 34.3' Lamin'd shaly SS/shale	○	○	○
37	34.3-34.5' Dk grey, soft, shale	○	○	○
38	34.5 - 34.9' Same as 31.2-33.7' but half is oxidized.	○	○	○
39	34.9-35.1' Dk grey, soft shale w/ oxidized fracture zone @ top.	○	○	○
40	35.1-35.9' Same as 31.2-33.7'	○	○	○
41	35.9-36.2' Interbedded shale / SS (grey).	○	○	○
42	36.2-36.9' Laminated shaly SS (grey) w/ oxid. fract @ 36.5'	○	○	○
43	36.9 - 37.1' Heavily oxid. + fract'd shale	○	○	○
44	37.1 - 37.4' Lam'd shaly SS (grey)	○	○	○
	37.4-41.2' Black Fissile Shale w/ vert. oxid. frac. @ 39'	○	○	○

+ clay filled horiz. frac. @ 39.8' Interbedded w/ Maroon shale @ bottom.

D R A F T

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION MW-10D	Moisture Content Dry	Moist	Wet
46	41.2-42.2' Black shale w/ thin sandy/silty laminations	○	○	○
47	heavily fract'd @ 42-42.2'	○	○	○
48	42.2-43.2' Grey competent SS w/ conglomerate c̄	○	○	○
49	last 4"	○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75		○	○	○

DRILLING LOG FOR MW-10S

Project Name Wellsville - Andover L.F.

Site Location W of NW fill area, W side of leachate collection sys.

Date Started/Finished 9-17-91 / 9-17-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) ______ Auger Size (s) 4¼" ID

Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 24.3'

Total Depth of Corehole Is NA

Water Level (TOIC)		
Date	Time	Level(Feet)
10-22-91	1356	14.30
11-20-91	1307	14.81
2-26-92	1109	9.61

Well Location Sketch

See MW-10D

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

MW-10D **DRAFT**

Stick-up ~2.5 ft

Inner Casing Material sch. 40 PVC

Inner Casing Inside Diameter 2 inches

Top of Grout 0 ft

Borehole Diameter 8-10 inches ft

Top of Seal at 7 ft

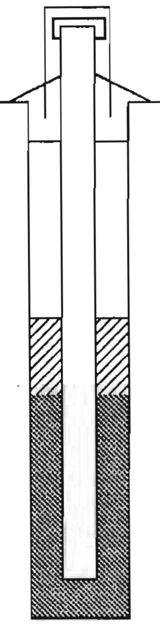
Bottom of Seal at 9'

Top of Screen at 14 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 24 ft

SCREENED WELL



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets
Cement
Cement/ Bentonite
Grout

Top of Sand Pack 9'

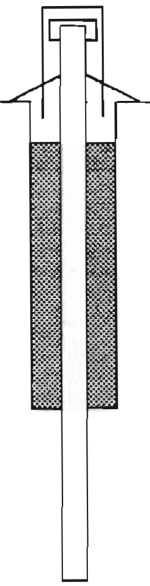
Screen Slot Size 0.010"

Screen Type
☒ PVC sch. 40
☐ Stainless Steel

Bottom of Hole at 24.3 ft

Bottom of Sandpack at 24.3'

OPEN-HOLE WELL



Stick-up ft

Inner Casing Material

Inner Casing Inside Diameter inches

Top of Grout ft

Bottom of Outer Casing ft

Borehole Diameter ft

Bedrock ft

Bottom of Rock Socket/ Grout/ Casing ft

Corehole Diameter

Bottom of Corehole ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	See log for MW-10D for lithology.	○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
		○	○	○

D R A F T

DRILLING LOG FOR MW-11S

Project Name Wellsville-Andover L.F.

Site Location South of site on LaDue's property

Date Started/Finished 10-3-91 / 10-4-91

Drilling Company American Auger & Ditching

Driller's Name Lee Penrod

Geologist's Name Rick Watt

Geologist's Signature R. Watt

Rig Type (s) Mobile B-57

Drilling Method (s) Auger

Bit Size (s) Auger Size (s) 4 1/4" ID

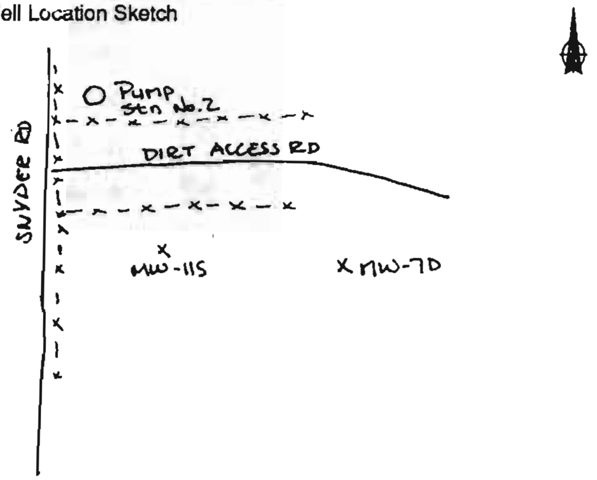
Auger/Split Spoon Refusal NA

Total Depth of Borehole Is 23.6'

Total Depth of Corehole Is

Water Level (TOIC)		
Date	Time	Level(Feet)
10-23-91	1435	7.71
11-20-91	1424	6.61
2-26-92	1200	4.46

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

DMR-1AS F T

Stick-up ~2.5 ft

Inner Casing Material Sch.40 PVC

Inner Casing Inside Diameter 2 Inches

Top of Grout 0 ft

Borehole Diameter 8-10 inches ____ ft

Top of Seal at 4 ft

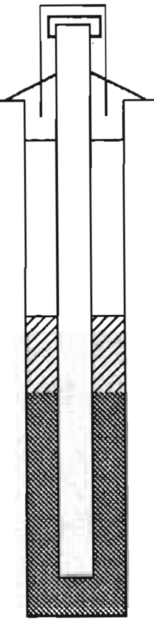
Bottom of Seal at 6

Top of Screen at 8 ft

Pack Type/Size:
☒ Sand #2 Q-Rok
☐ Gravel
☐ Natural

Bottom of Screen at 18 ft

SCREENED WELL



Lock Number 3252

GROUND SURFACE

Quantity of Material Used:
Bentonite Pellets ____
Cement ____
Cement/ Bentonite ____
Grout ____

Top of Sand Pack 6

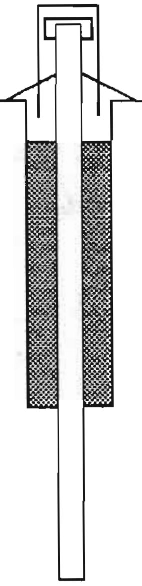
Screen Slot Size 0.010"

Screen Type ____
☒ PVC Sch.40
☐ Stainless Steel -

Bottom of Hole at 23.6 ft

Bottom of Sandpack at 23.6

OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material ____

Inner Casing Inside Diameter ____ Inches

Top of Grout ____ ft

Bottom of Outer Casing ____ ft

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Grout/ Casing ____ ft

Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 109 and 110 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
1	See log for MW-7D for detailed lithology - Split spoon samples	○	○	○
2	described below collected for geotechnical sampling.	○	○	○
3		○	○	○
4	Auger cuttings to 10' indicate gravelly sandy silt w/ clay, Lt brn to	○	○	○
5	4', reddish brn to 7', then Lt brn again.	○	○	○
6	14-15' Moist clayey gravel w/ silt & sand. Gravel is ang. grey	○	○	○
7	SS frags.	○	○	○
8	15-16' Wet dark brown sandy clay w/ silt and gravel	○	○	○
9	16-17' Same but moist and reddish-brn.	○	○	○
10	17-21' Same as 15-16'	○	○	○
11	21-24' Saturated sandy clay	○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
		○	○	○

APPENDIX C

MONITORING WELL DEVELOPMENT DATA

Table C-1

WELL DEVELOPMENT RECORD FOR MW-1D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	8.34	128	8	150	10-08-91 0850
3	1.6	8.82	126	10	>200	10-08-91 0857
5	2.6	8.26	130	10	>200	10-08-91 0958
6	3.2	9.10	228	10	>200	10-08-91 1236
6	3.2	--	125	11	2,000	10-17-91 1746
11	6.5	--	127	11	3,600	10-17-91 1810
16	9.8	--	128	10.5	1,280	10-18-91 0839
18	11.1	--	131	10.5	700	10-18-91 0924
21	13.1	--	128	10.5	915	10-18-91 0942
23	14.4	--	126	10.5	700	10-18-91 1003
26	16.4	--	126	10.5	900	10-18-91 1021

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-2

WELL DEVELOPMENT RECORD FOR MW-2D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading	
Gallons	Well Volume						
0	0	10.24	323	14	>200	10-08-91	1322
5	3.2	6.97	231	13	>200	10-08-91	1332
10	6.5	7.14	238	13	>200	10-08-91	1342
15	9.7	7.07	203	13	>200	10-08-91	1353
20	12.9	7.06	201	13	184.8	10-08-91	1403
25	16.1	7.05	202	13	125.4	10-08-91	1416
30	19.4	7.05	199	13	92.9	10-08-91	1430
35	22.6	7.04	205	13	68.3	10-08-91	1442
40	25.8	7.10	210	13	>200	10-08-91	1455
45	29.0	6.96	232	13	>200	10-08-91	1632
55	35.5	7.04	201	13	>200	10-08-91	1640
65	41.9	7.07	204	13	>200	10-08-91	1654
75	48.4	7.10	206	13	>200	10-08-91	1702
85	54.8	7.08	204	13	>200	10-08-91	1710
95	61.3	7.08	206	13	>200	10-08-91	1718
105	67.7	7.10	206	13	>200	10-08-91	1726
115	74.2	7.11	203	13	>200	10-08-91	1734
135	87.1	7.09	211	13	>200	10-08-91	1750
155	100.0	7.07	205	13	>200	10-08-91	1806

Table C-2

WELL DEVELOPMENT RECORD FOR MW-2D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
175	112.9	7.09	205	13	>200	10-08-91 1822
200	129.0	7.08	205	13	>200	10-08-91 1840
200	129.0	--	284	13	>1,000	10-16-91 0940
205	132.6	--	240	11	>1,000	10-16-91 0958
210	136.2	--	216	11	>1,000	10-16-91 1004
215	139.8	--	219	11	>1,000	10-16-91 1018
220	143.4	--	213	11	>1,000	10-16-91 1030

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-3

WELL DEVELOPMENT RECORD FOR MW-2S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	--	484	14.5	>1,000	10-16-91 0930
1	4.5	--	472	10.5	>1,000	10-16-91 1013
1.5	6.8	--	472	15.0	>4,000	10-19-91 1112

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-4

WELL DEVELOPMENT RECORD FOR MW-3D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading	
Gallons	Well Volume						
0	0	10	319	12	>1,000	10-09-91	0834
5	1.1	10.2	360	13	>200	10-09-91	0951
8	1.8	9.28	287	18	>200	10-09-91	1236
8	1.8	--	325	12	>4,000	10-17-91	1650
13	2.9	--	319	12	>4,000	10-17-91	1659
15	3.3	--	312	12	>4,000	10-17-91	1728
15	3.3	--	318	11	>4,000	10-18-91	0850
20	4.4	--	329	11	>4,000	10-18-91	0905
25	5.5	--	316	11	>4,000	10-18-91	1100
26.5	5.8	--	310	11.5	>4,000	10-18-91	1225

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-5

WELL DEVELOPMENT RECORD FOR MW-3S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading	
Gallons	Well Volume						
0	0	7.17	297	14	18.6	10-09-91	1105
1	1.8	7.46	294	14	>200	10-09-91	1109
1.5	2.6	7.10	365	14	>200	10-09-91	1117
1.8	3.2	7.08	369	14	>400	10-09-91	1240
1.8	3.2	--	255	14	>4,000	10-17-91	1630
6.8	6.3	--	263	14	>4,000	10-17-91	1650
9	7.7	--	265	13.5	>4,000	10-17-91	1725
9	7.7	--	268	11	>4,000	10-18-91	0850
10	8.3	--	272	11	>4,000	10-18-91	0905
11	8.9	--	300	11	>4,000	10-18-91	1050

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-6

WELL DEVELOPMENT RECORD FOR MW-4D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	6.85	165	11	>200	10-07-91 1705
5	2.5	6.88	145	11	>200	10-07-91 1712
10	4.9	6.91	142	11	>200	10-07-91 1725
15	7.4	6.82	121	11	109	10-07-91 1734
20	9.8	6.91	151	11	100	10-07-91 1745
25	12.3	6.84	149	11	75	10-07-91 1755
30	14.7	6.99	123	11	69	10-07-91 1807
40	19.6	6.96	119	11	57	10-07-91 1824
50	24.5	6.86	115	11	59	10-07-91 1842
60	29.4	6.85	112	11	54	10-07-91 1856
60	29.4	--	107	13.5	>4,000	10-16-91 1556
70	33.9	--	93	12.5	1,740	10-16-91 1604
75	36.2	--	91	12.5	~2,000	10-16-91 1618
80	38.5	--	91	12.5	~2,000	10-16-91 1629

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-7

WELL DEVELOPMENT RECORD FOR MW-5D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	9.12	320	--	>1,000	09-26-91 0910
5	0.9	8.64	191	--	>1,000	09-26-91 0920
10	1.8	9.41	209	--	>1,000	09-26-91 0938
15	2.6	8.50	186	--	>1,000	09-26-91 0953
20	3.5	7.62	163	--	>1,000	09-26-91 1002
25	4.4	7.29	165	--	200	09-26-91 1015
30	5.3	7.26	166	--	300	09-26-91 1028
35	6.2	7.28	168	--	350	09-26-91 1043
40	7.0	7.21	168	--	430	09-26-91 1056
45	7.9	7.25	161	--	430	09-26-91 1111
50	8.8	7.06	158	--	400	09-26-91 1124
55	9.7	7.12	156	--	360	09-26-91 1139
60	10.6	7.16	155	--	260	09-26-91 1156
65	11.4	7.10	156	--	400	09-26-91 1210
65	11.4	--	220	13	32	10-15-91 1120
70	12.3	--	180	11	>1,000	10-15-91 1130
75	13.3	--	176	11	>1,000	10-15-91 1140
80	14.2	--	185	11	>1,000	10-15-91 1150
85	15.2	--	164	11	415	10-15-91 1158

Table C-7

WELL DEVELOPMENT RECORD FOR MW-5D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
90	16.1	--	173	11	>1,000	10-15-91 1210
95	17.0	--	153	11	>1,000	10-15-91 1220
100	18.0	--	164	11	>1,000	10-15-91 1228
105	18.9	--	168	11	>1,000	10-15-91 1230

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-8

WELL DEVELOPMENT RECORD FOR MW-5S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	7.17	200	11	>200	10-08-91 1334
5	1.6	7.02	184	12	>200	10-08-91 1350
10	3.2	6.95	184	12	>200	10-08-91 1412
15	4.8	7.02	170	12	>200	10-08-91 1448
20	6.5	6.78	149	12	30	10-08-91 1520
22	7.1	6.84	168	12	148	10-08-91 1529
25	8.1	6.96	172	13	>200	10-08-91 1605
30	9.7	6.92	161	13	>200	10-08-91 1624
35	11.3	7.06	163	13	>200	10-08-91 1650
35	11.3	--	146	13	27	10-15-91 1120
40	13.2	--	150	12	>1,000	10-15-91 1130
45	15.0	--	143	12	>1,000	10-15-91 1215
50	16.9	--	139	12	>1,000	10-15-91 1220
55	18.7	--	143	12	>1,000	10-15-91 1230

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-9

WELL DEVELOPMENT RECORD FOR MW-6D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	6.55	158	12	>200	10-10-91 1356
2.5	0.9	6.54	157	12	>200	10-10-91 1403
3	1.1	6.92	167	12	>200	10-10-91 1410
5	1.9	6.69	159	12	>200	10-10-91 1438
6	2.2	6.89	150	12	>200	10-10-91 1532
6	2.2	5.96	142	12	>200	10-11-91 1135
8.5	3.2	6.52	147	12	>200	10-11-91 1141
9.5	3.5	6.59	152	12	>200	10-11-91 1149
10	3.7	6.71	142	11	>200	10-11-91 1214
10	3.7	--	140	11	>4,000	10-16-91 1712
15	6.2	--	140	11	>4,000	10-16-91 1720
15	6.2	--	135	11	~2,000	10-17-91 0853
20	8.7	--	139	11	~2,000	10-17-91 0934

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-10

WELL DEVELOPMENT RECORD FOR MW-6S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	6.81	161	12	>200	10-10-91 1416
2.5	3.1	6.72	149	12	>200	10-10-91 1423
4	4.9	6.34	152	12	>200	10-10-91 1441
4.5	5.6	6.63	154	12	>200	10-10-91 1516
5	6.2	6.75	149	12	>200	10-10-91 1529
5	6.2	6.68	115	12	>200	10-11-91 1139
7	8.6	6.52	132	12	>200	10-11-91 1144
7.5	9.3	6.50	125	12	>200	10-11-91 1151
8	10.1	--	130	12	>4,000	10-16-91 1707
9.5	12.5	--	138	12	>4,000	10-16-91 1725
9.5	12.5	--	127	12.5	>4,000	10-17-91 0853
12	16.5	--	127	12.5	>4,000	10-17-91 0939

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-11

WELL DEVELOPMENT RECORD FOR MW-7D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading	
Gallons	Well Volume						
0	0	7.15	252	13	>200	10-09-91	1551
4	1.8	6.92	259	11	>200	10-09-91	1609
5	2.2	7.22	256	11	>200	10-09-91	1616
6	2.6	7.22	259	11	>200	10-09-91	1705
7.5	3.3	6.95	260	11	>200	10-09-91	1711
7.5	3.3	--	261	12	~2,000	10-17-91	1420
12.5	5.5	--	265	11.5	~2,000	10-17-91	1438
14	6.2	--	269	11	1,700	10-17-91	1524
16	7.0	--	265	12	850	10-17-91	1604
20	8.8	--	258	11	782	10-18-91	1133
23	10.1	--	262	11	820	10-18-91	1150

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-12

WELL DEVELOPMENT RECORD FOR MW-8S

Volume Purged						
Gallons	Well Volume	pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
0	0	5.12	607	14	>200	10-10-91 1605
2.5	1.7	5.87	641	14	>200	10-10-91 1616
5	3.4	5.79	656	14	>200	10-10-91 1622
7	4.7	6.49	565	14	>200	10-10-91 1629
8	5.4	6.56	583	14	>200	10-10-91 1656
9	6.1	6.63	571	14	>200	10-10-91 1704
10	6.8	6.68	584	14	>200	10-10-91 1708
11	7.5	6.52	588	14	>200	10-10-91 1733
12	8.1	6.57	586	14	>200	10-10-91 1740
12	8.1	6.79	585	13	>200	10-11-91 1027
14.5	9.8	6.80	583	13	>200	10-11-91 1036
17	11.5	6.77	578	13	>200	10-11-91 1041
19.5	13.2	6.77	582	13	>200	10-11-91 1058
20	13.6	6.63	586	13	>200	10-11-91 1107
20	13.6	--	--	13.5	840	10-15-91 1000
25	16.9	--	--	13	>1,000	10-15-91 1010
30	20.3	--	--	12	>1,000	10-15-91 1050

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-13

WELL DEVELOPMENT RECORD FOR MW-9D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	8.71	302	12	70	10-09-91 1349
3	0.9	9.50	266	12	>200	10-09-91 1407
5	1.6	7.32	244	12	>200	10-09-91 1420
5	1.6	10.15	389	10	>200	10-11-91 0849
7.5	2.3	10.12	390	11	>200	10-11-91 0858
9	2.8	9.61	302	11	>200	10-11-91 0911
10	3.1	9.54	289	11	>200	10-11-91 0917
10.5	3.3	9.24	277	11	>200	10-11-91 0942
11	3.4	9.74	271	11	>200	10-11-91 0951
11	3.4	--	281	11	>1,000	10-15-91 1510
15	4.7	--	267	11	>1,000	10-15-91 1540
20	6.3	--	245	11	>1,000	10-15-91 1628
25	7.8	--	235	11	>1,000	10-15-91 1715
25	7.8	--	217	10.8	>1,000	10-16-91 1052
30	9.4	--	229	10.5	>1,000	10-16-91 1110
35	10.9	--	313	11	>1,000	10-16-91 1310

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-14

WELL DEVELOPMENT RECORD FOR MW-9S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	6.19	429	15	62	10-09-91 1433
1	3.1	7.08	444	14	>200	10-09-91 1439
1	3.1	6.75	429	12	>200	10-11-91 0845
1.5	4.7	6.96	437	12	>200	10-11-91 0947
1.5	4.7	--	437	13	>1,000	10-15-91 1545
2.5	9.7	--	415	13	>1,000	10-15-91 1730
2.5	9.7	--	468	12	875	10-16-91 1055
2.7	10.7	--	440	12	>1,000	10-16-91 1120

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-15

WELL DEVELOPMENT RECORD FOR MW-10D

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	9.25	197	12	>200	10-10-91 0842
2.5	0.5	10.93	404	12	>200	10-10-91 0853
5	1	10.07	260	12	>200	10-10-91 0903
7.5	1.4	10.09	259	12	>200	10-10-91 0913
10	1.9	9.02	189	12	>200	10-10-91 0920
15	2.9	6.95	169	12	>200	10-10-91 0939
20	3.8	7.75	167	12	>200	10-10-91 0946
25	4.8	8.77	174	12	>200	10-10-91 1000
30	5.8	7.77	162	12	>200	10-10-91 1015
35	6.7	6.76	160	13	>200	10-10-91 1031
45	8.7	7.04	160	13	>200	10-10-91 1109
53	10.2	6.57	158	13	>200	10-10-91 1143
53	10.2	--	360	12	>1,000	10-16-91 1355
58	11.7	--	313	11	>1,000	10-16-91 1405
63	13.1	--	164	11	>1,000	10-16-91 1412
68	14.6	--	162	11	>1,470	10-16-91 1427
73	16.1	--	156	11	~2,000	10-16-91 1436
78	17.6	--	151	11	~2,000	10-16-91 1447
83	19.0	--	151	10.8	~2,000	10-16-91 1518

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-16

WELL DEVELOPMENT RECORD FOR MW-10S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	7.03	183	12	>200	10-10-91 0930
2.5	1.2	6.37	162	12	>200	10-10-91 0936
5	2.4	6.66	180	12	>200	10-10-91 0943
7	3.3	6.31	175	12	>200	10-10-91 0551
9	4.3	6.65	158	12	>200	10-10-91 1037
10	4.8	6.54	153	12	>200	10-10-91 1042
14	6.7	6.38	131	12	>200	10-10-91 1145
14	6.7	--	145	12.2	>1,000	10-16-91 1345
19	9.2	--	146	12	>1,000	10-16-91 1410
24	11.7	--	130	12	>4,000	10-16-91 1436
26	12.7	--	129	12	>4,000	10-16-91 1514

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

Table C-17

WELL DEVELOPMENT RECORD
FOR MW-11S

Volume Purged		pH	Conductivity (ppm)	Temperature (°C)	Turbidity (NTU)	Date and Time of Reading
Gallons	Well Volume					
0	0	7.10	306	16	>200	10-09-91 1536
2.5	1.3	7.24	292	15	>200	10-09-91 1545
5	2.6	7.07	295	15	>200	10-09-91 1557
7.5	4.0	6.97	293	14	>200	10-09-91 1605
10	5.3	6.99	292	14	>200	10-09-91 1614
12.5	6.6	6.89	298	14	>200	10-09-91 1620
15	7.9	6.82	295	14	>200	10-09-91 1628
20	10.6	6.80	301	16	>200	10-09-91 1654
22	11.7	6.86	295	16	>200	10-09-91 1704
22	11.7	--	302	14	>4,000	10-17-91 1032
25	13.3	--	293	14	>4,000	10-17-91 1036
30	16.0	--	304	13.5	>4,000	10-17-91 1044
35	18.6	--	299	13.5	>4,000	10-17-91 1055
40	21.3	--	292	13.5	>4,000	10-17-91 1105
45	24.0	--	308	13.5	1,680	10-17-91 1149
50	26.7	--	305	13.5	>4,000	10-17-91 1200
55	29.3	--	302	14	>4,000	10-17-91 1358
60	32.0	--	301	13.5	>4,000	10-17-91 1406

Note: Data gaps exist where instrument failure occurred. Where the turbidity is preceded by ">", the value indicates the upper limit of the instrument.

APPENDIX D

ANALYTICAL DATA SUMMARY FORMS

The following data summary forms are from the data validation reports prepared by E & E's subcontractor ChemWorld Environmental, Inc. These tables were then corrected based on E & E's data validation review. All ChemWorld data validation reports and E & E data validation review memorandums pertaining to environmental sampling at the Wellsville-Andover Landfill have been provided to NYSDEC under separate cover.

DATA SUMMARY TABLES

VOLATILE ORGANICS

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.123

All results reported in ug/kg

Reanalyzed - see case no. 9102.414

Parameters - Volatiles	~~MW-2~~(SB-2A)	~~MW-3~~(SB-3A)	~~MW-3~~(SB-3B)	SB-10A	SB-1A	SB-1B	SB-4A	SB-4B	SB-5B	SB-5C	SB-6A	SB-6ARE
Chloromethane	UJ	UJ	UJ								UJ	
Bromomethane	UJ	UJ	UJ								UJ	
Vinyl Chloride	UJ	UJ	UJ						21	7 J	UJ	
Chloroethane	UJ	UJ	UJ								UJ	
Methylene Chloride	18 UJ	21 UJ	18 UJ	11 U	11 U	7 U	8 U	7 U	10 U	8 U	9 UJ	7 U
Acetone	63 UJ	31 UJ	24 UJ	15 U	10 U	22 U	10 U	11 U	11 U	12 U	25 UJ	10 U
Carbon Disulfide	UJ	UJ	UJ								UJ	
1,1-Dichloroethylene	UJ	UJ	UJ								UJ	
1,1-Dichloroethane	UJ	UJ	UJ								UJ	
Total 1,2-Dichloroethylene	UJ	UJ	UJ						87	61	UJ	
Chloroform	UJ	UJ	UJ								UJ	
1,2-Dichloroethane	UJ	UJ	UJ								UJ	
2-Butanone	4 J	UJ	UJ								UJ	
1,1,1-Trichloroethane	UJ	UJ	UJ								UJ	
Carbon Tetrachloride	UJ	UJ	UJ								UJ	
Vinyl Acetate	UJ	UJ	UJ								UJ	
Bromodichloromethane	UJ	UJ	UJ								UJ	
1,2-Dichloropropane	UJ	UJ	UJ								UJ	
Cis-1,3-Dichloropropene	UJ	UJ	UJ								UJ	
Trichloroethene	UJ	UJ	UJ						22	13	UJ	
Dibromochloromethane	UJ	UJ	UJ								UJ	
1,1,2-Trichlorethane	UJ	UJ	UJ								UJ	
Benzene	UJ	UJ	UJ								UJ	
Trans-1,3-Dichloropropene	UJ	UJ	UJ								UJ	
Bromoform	UJ	UJ	UJ								UJ	
4-Methyl-2-pentanone	UJ	UJ	UJ								UJ	
2-Hexanone	UJ	UJ	UJ								UJ	
Tetrachloroethene	UJ	UJ	UJ								UJ	
1,1,2,2-Tetrachloroethane	UJ	UJ	UJ								UJ	
Toluene	UJ	UJ	UJ								UJ	
Chlorobenzene	UJ	UJ	UJ								UJ	
Ethylbenzene	UJ	UJ	UJ								UJ	
Styrene	UJ	UJ	UJ								UJ	
Total Xylenes	UJ	UJ	UJ								UJ	

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WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.123

All results reported in ug/kg

Parameters - Volatiles	SB-6B	VBLKS1	VBLKS2	VBLKS3	VBLKS4	VBLKS5	VBLKS6	SB-5CMS	SB-5CMSD	MSB
Chloromethane					UJ					
Bromomethane					UJ					
Vinyl Chloride					UJ			2 J	4 J	
Chloroethane					UJ					
Methylene Chloride	8 U	9	6	17	9 J	7	3 J	9 U	11 U	8 U
Acetone	15 U	19	7 J	23	3 J	6 J		15 U	18 U	10 U
Carbon Disulfide					UJ					
1,1-Dichloroethylene					UJ			39	41	31
1,1-Dichloroethane					UJ					
Total 1,2-Dichloroethylene					UJ			48	65	
Chloroform					UJ					
1,2-Dichloroethane					UJ					
2-Butanone					UJ					
1,1,1-Trichloroethane					UJ					
Carbon Tetrachloride					UJ					
Vinyl Acetate					UJ					
Bromodichloromethane					UJ					
1,2-Dichloropropane					UJ					
Cis-1,3-Dichloropropene					UJ					
Trichloroethene					UJ			62	65	45
Dibromochloromethane					UJ					
1,1,2-Trichlorethane					UJ					
Benzene					UJ			49	52	48
Trans-1,3-Dichloropropene					UJ					
Bromoform					UJ					
4-Methyl-2-pentanone					UJ					
2-Hexanone					UJ					
Tetrachloroethene					UJ					
1,1,2,2-Tetrachloroethane					UJ					
Toluene					UJ			51	52	49
Chlorobenzene					UJ			49	49	47
Ethylbenzene					UJ					
Styrene					UJ					
Total Xylenes			1 J		UJ					

D R A F T

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.282

All results reported in ug/kg

Parameters - Volatiles	SB-10B	SB-8A	SB-8AD	SB-8B	SB-9A	SB-9B	VBLKS1	VBLKS2	SB-9B-MS	SB-10B-MS	SB-9B-MSD	SB-10B-MSD
Chloromethane												
Bromomethane												
Vinyl Chloride												
Chloroethane												
Methylene Chloride	12 U	6 U	8 U	7 U	8 U	6 U	7	5	6 U	11 U	7 U	13 U
Acetone	12 U		17 U		19 U	17 U	6 J	5 J	10 U	15 U	10 U	14 U
Carbon Disulfide												
1,1-Dichloroethylene									61	40 J	50 J	50
1,1-Dichloroethane												
Total 1,2-Dichloroethylene												
Chloroform												
1,2-Dichloroethane												
2-Butanone												
1,1,1-Trichloroethane												
Carbon Tetrachloride												
Vinyl Acetate												
Bromodichloromethane												
1,2-Dichloropropane												
Cis-1,3-Dichloropropene												
Trichloroethene									49	38 J	49 J	55
Dibromochloromethane												
1,1,2-Trichlorethane												
Benzene									50	42 J	51 J	61
Trans-1,3-Dichloropropene												
Bromoform												
4-Methyl-2-pentanone												
2-Hexanone												
Tetrachloroethene												
1,1,2,2-Tetrachloroethane												
Toluene									50	46 J	53 J	64
Chlorobenzene									49	41 J	53 J	59
Ethylbenzene												
Styrene												
Total Xylenes												

WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/L**

Parameters - Volatiles	DW-1	R-1	VBLKW1	MSB
Chloromethane				
Bromomethane				
Vinyl Chloride				
Chloroethane				
Methylene Chloride	8 U	12 U	3 J	16 U
Acetone				
Carbon Disulfide				
1,1-Dichloroethylene				46
1,1-Dichloroethane				
Total 1,2-Dichloroethylene				
Chloroform		36		
1,2-Dichloroethane				
2-Butanone				
1,1,1-Trichloroethane				
Carbon Tetrachloride				
Vinyl Acetate				
Bromodichloromethane		17		
1,2-Dichloropropane				
Cis-1,3-Dichloropropene				
Trichloroethene				49
Dibromochloromethane		5		
1,1,2-Trichlorethane				
Benzene				51
Trans-1,3-Dichloropropene				
Bromoform				
4-Methyl-2-pentanone				
2-Hexanone				
Tetrachloroethene				
1,1,2,2-Tetrachloroethane				
Toluene				52
Chlorobenzene				52
Ethylbenzene				
Styrene				
Total Xylenes				

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/L

Parameters - Volatiles	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	TB-1	TB-1RE	VBLKW1	VBLKW2	MSB	SW-4MS	SW-4MSD
Chloromethane								UJ						
Bromomethane								UJ						
Vinyl Chloride								UJ						
Chloroethane								UJ						
Methylene Chloride	6 U	6 U	7 U	6 U	6 U	6 U	6 U	UJ	7 U	5	7	7 U	7 U	7 U
Acetone								UJ						
Carbon Disulfide								UJ						
1,1-Dichloroethylene								UJ				42	40	40
1,1-Dichloroethane								UJ						
Total 1,2-Dichloroethylene								UJ						
Chloroform								UJ						
1,2-Dichloroethane								UJ						
2-Butanone								UJ						
1,1,1-Trichloroethane								UJ						
Carbon Tetrachloride								UJ						
Vinyl Acetate								UJ						
Bromodichloromethane								UJ						
1,2-Dichloropropane								UJ						
Cis-1,3-Dichloropropene								UJ						
Trichloroethene								UJ				48	46	44
Dibromochloromethane								UJ						
1,1,2-Trichlorethane								UJ						
Benzene								UJ				49	50	49
Trans-1,3-Dichloropropene								UJ						
Bromoform								UJ						
4-Methyl-2-pentanone								UJ						
2-Hexanone								UJ						
Tetrachloroethene								UJ						
1,1,2,2-Tetrachloroethane								UJ						
Toluene								UJ				50	48	47
Chlorobenzene								UJ				46	45	44
Ethylbenzene								UJ						
Styrene								UJ						
Total Xylenes								UJ						

D R A F T

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/kg

Parameters - Volatiles	SB-7A	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-6	VBLKS1	SED-4MSD	SED-4-MS
Chloromethane												
Bromomethane												
Vinyl Chloride												
Chloroethane												
Methylene Chloride	11 U	12 U	19 U	18 U	14 U	20 U	21 U	10 U	12 U	10	20 U	21 U
Acetone			20	30	10 J	31	38	11 J			66	27
Carbon Disulfide												
1,1-Dichloroethylene											99	89
1,1-Dichloroethane												
Total 1,2-Dichloroethylene												
Chloroform												
1,2-Dichloroethane												
2-Butanone												
1,1,1-Trichloroethane												
Carbon Tetrachloride												
Vinyl Acetate												
Bromodichloromethane												
1,2-Dichloropropane												
Cis-1,3-Dichloropropene												
Trichloroethene											84	80
Dibromochloromethane												
1,1,2-Trichlorethane												
Benzene											92	87
Trans-1,3-Dichloropropene												
Bromoform												
4-Methyl-2-pentanone												
2-Hexanone												
Tetrachloroethene												
1,1,2,2-Tetrachloroethane												
Toluene											100	92
Chlorobenzene											88	83
Ethylbenzene												
Styrene												
[illegible]al Xylenes												

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/L

Parameters - Volatiles	(MH-4) L-1	(PS-2) L-2	TB-2	VBLKW1	VBLKW2	MSB
Chloromethane						
Bromomethane						
Vinyl Chloride						
Chloroethane						
Methylene Chloride	7 U	13 U	7 U	7	9	7 U
Acetone						
Carbon Disulfide						
1,1-Dichloroethylene						42
1,1-Dichloroethane						
Total 1,2-Dichloroethylene	8	2 J				
Chloroform						
1,2-Dichloroethane						
2-Butanone						
1,1,1-Trichloroethane						
Carbon Tetrachloride						
Vinyl Acetate						
Bromodichloromethane						
1,2-Dichloropropane						
Cis-1,3-Dichloropropene						
Trichloroethene	2 J	14				48
Dibromochloromethane						
1,1,2-Trichlorethane						
Benzene						49
Trans-1,3-Dichloropropene						
Bromoform						
4-Methyl-2-pentanone						
2-Hexanone						
Tetrachloroethene						
1,1,2,2-Tetrachloroethane						
Toluene						50
Chlorobenzene		3 J				46
Ethylbenzene						
Styrene						
Total Xylenes						

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/kg

Parameters - Volatiles	~~Mw-2~~ SB-2A	~~Mw-3~~ SB-3A	~~Mw-3~~ SB-3B	SS-1	SS-1-RE	SS-2	SS-2-RE	SS-3	SS-4	SS-5	SS-6	SS-7
Chloromethane				UJ			UJ					40 J
Bromomethane				UJ			UJ					UJ
Vinyl Chloride				UJ			UJ					UJ
Chloroethane				UJ			UJ					UJ
Methylene Chloride	11 U	11 U	11 U	14 UJ	12 U	16 U	16 UJ	20 U	11 U	17 U	12 U	35 UJ
Acetone	12 U	12 U	27 U	16 UJ	27 U		19 UJ	19 U	12 U		26 U	42 UJ
Carbon Disulfide				UJ			UJ					UJ
1,1-Dichloroethylene				UJ			UJ					UJ
1,1-Dichloroethane				UJ			UJ					UJ
Total 1,2-Dichloroethylene				UJ			UJ					UJ
Chloroform				UJ			UJ					UJ
1,2-Dichloroethane				UJ			UJ					UJ
2-Butanone				UJ			UJ					UJ
1,1,1-Trichloroethane				UJ			UJ					
Carbon Tetrachloride				UJ			UJ					
Vinyl Acetate				UJ			UJ					
Bromodichloromethane				UJ			UJ					
1,2-Dichloropropane				UJ			UJ					
Cis-1,3-Dichloropropene				UJ			UJ					
Trichloroethene				UJ			UJ					
Dibromochloromethane				UJ			UJ					
1,1,2-Trichlorethane				UJ			UJ					
Benzene				UJ			UJ					
Trans-1,3-Dichloropropene				UJ			UJ					
Bromoform				UJ			UJ					
4-Methyl-2-pentanone				UJ			UJ					UJ
2-Hexanone				UJ			UJ					UJ
Tetrachloroethene				UJ			UJ					UJ
1,1,2,2-Tetrachloroethane				UJ			UJ					UJ
Toluene				UJ			UJ					UJ
Chlorobenzene				UJ			UJ					UJ
Ethylbenzene				UJ			UJ				1 J	18 J
Styrene				UJ			UJ					UJ
Total X[illegible]es				UJ			UJ					[illegible]J

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WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Parameters - Volatiles	SS-7-RE	SS-8	SS-9	SS-10	SS-10D	SS-10D-RE	SS-11	SS-12	SS-13	SS-13-RE	SS-14	VBLKS1	VBLKS2
Chloromethane	14 J								UJ	UJ			
Bromomethane									UJ	UJ			
Vinyl Chloride									UJ	UJ			
Chloroethane									UJ	UJ			
Methylene Chloride	14 U	15 U	15 U	10 U	16 U	11 U	23 U	18 U	12 UJ	11 UJ	14 U	13	12
Acetone	53 U	10 U		13 U			240		UJ	UJ	20 U	10	5 J
Carbon Disulfide									UJ	UJ			
1,1-Dichloroethylene									UJ	UJ			
1,1-Dichloroethane									UJ	UJ			
Total 1,2-Dichloroethylene									UJ	UJ			
Chloroform									UJ	UJ			
1,2-Dichloroethane									UJ	UJ			
2-Butanone									UJ	UJ			
1,1,1-Trichloroethane									UJ	UJ			
Carbon Tetrachloride									UJ	UJ			
Vinyl Acetate									UJ	UJ			
Bromodichloromethane									UJ	UJ			
1,2-Dichloropropane									UJ	UJ			
Cis-1,3-Dichloropropene									UJ	UJ			
Trichloroethene									UJ	UJ			
Dibromochloromethane									UJ	UJ			
1,1,2-Trichlorethane									UJ	UJ			
Benzene						UJ			UJ	UJ			
Trans-1,3-Dichloropropene									UJ	UJ			
Bromoform									UJ	UJ			
4-Methyl-2-pentanone	UJ				UJ				UJ	UJ			
2-Hexanone	UJ				UJ				UJ	UJ			
Tetrachloroethene	UJ				UJ				UJ	UJ			
1,1,2,2-Tetrachloroethane	UJ				UJ				UJ	UJ			
Toluene	UJ				UJ	UJ			UJ	UJ			
Chlorobenzene	UJ				UJ	UJ			UJ	UJ			
Ethylbenzene	11 J				UJ	UJ			UJ	UJ			
Styrene	UJ				UJ	UJ			UJ	UJ			
Total Xylenes	UJ				UJ	UJ			UJ	UJ			2 J

WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Parameters - Volatiles	VBLKS3	VBLKS4	VBLKS5	MSB1	SS-4MS	SS-4MSD
Chloromethane						
Bromomethane						
Vinyl Chloride						
Chloroethane						
Methylene Chloride	9	8	8	9 U	11 U	11 U
Acetone	6 J				10 U	10 U
Carbon Disulfide						
1,1-Dichloroethylene				36	40	41
1,1-Dichloroethane						
Total 1,2-Dichloroethylene						
Chloroform						
1,2-Dichloroethane						
2-Butanone						
1,1,1-Trichloroethane						
Carbon Tetrachloride						
Vinyl Acetate						
Bromodichloromethane						
1,2-Dichloropropane						
Cis-1,3-Dichloropropene						
Trichloroethene				42	46	45
Dibromochloromethane						
1,1,2-Trichlorethane						
Benzene				46	51	50
Trans-1,3-Dichloropropene						
Bromoform						
4-Methyl-2-pentanone						
2-Hexanone						
Tetrachloroethene						
1,1,2,2-Tetrachloroethane						
Toluene				46	51	52
Chlorobenzene				43	48	49
Ethylbenzene						
Styrene						
otal Xylenes						

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.556

All results reported in ug/L

Parameters - Volatiles	GW-1D	GW-2D	GW-2DDL	GW-2S	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-9S	GW-10D	GW-10S
Chloromethane												
Bromomethane												
Vinyl Chloride		290 E	160 D									
Chloroethane												
Methylene Chloride			26 DJ									
Acetone						33						
Carbon Disulfide												
1,1-Dichloroethylene		3 J										
1,1-Dichloroethane												
Total 1,2-Dichloroethylene		770 E	520 D								3 J	
Chloroform										2 J		
1,2-Dichloroethane												
2-Butanone												
1,1,1-Trichloroethane		1 J										
Carbon Tetrachloride												
Vinyl Acetate												
Bromodichloromethane												
1,2-Dichloropropane												
Cis-1,3-Dichloropropene												
Trichloroethene		320 E	230 D		2 J		1 J				3 J	
Dibromochloromethane												
1,1,2-Trichlorethane												
Benzene												
Trans-1,3-Dichloropropene												
Bromoform												
4-Methyl-2-pentanone												
2-Hexanone												
Tetrachloroethene												
1,1,2,2-Tetrachloroethane												
Toluene												
Chlorobenzene												
Ethylbenzene												
Styrene												
Total Xylenes												

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WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.556

All results reported in ug/L

Parameters - Volatiles	VBLKW1	VBLKW2	MSB	GW-10DMS	GW-10DMSD
Chloromethane					
Bromomethane					
Vinyl Chloride					
Chloroethane					
Methylene Chloride				2 J	
Acetone					
Carbon Disulfide					
1,1-Dichloroethylene			45	30	25
1,1-Dichloroethane					
Total 1,2-Dichloroethylene				3 J	4J
Chloroform					
1,2-Dichloroethane					
2-Butanone					
1,1,1-Trichloroethane					
Carbon Tetrachloride					
Vinyl Acetate					
Bromodichloromethane					
1,2-Dichloropropane					
Cis-1,3-Dichloropropene					
Trichloroethene			44	46	43
Dibromochloromethane					
1,1,2-Trichlorethane					
Benzene			44	47	46
Trans-1,3-Dichloropropene					
Bromoform					
4-Methyl-2-pentanone					
2-Hexanone					
Tetrachloroethene					
1,1,2,2-Tetrachloroethane					
Toluene			47	46	44
Chlorobenzene			48	49	48
Ethylbenzene					
Styrene					
To Xylenes					

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WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters - Volatiles	GW-5D	GW-5DDL	GW-5S	GW-5SDL	GW-6D	GW-6DDL	GW-6S	GW-7D	GW-11S	GW-11SDL	GW-11SDD
Chloromethane	UJ										
Bromomethane	UJ										
Vinyl Chloride	1700 E	1400 D	3300 E	2100 D	63	34 D			110 J	100 D	110
Chloroethane	UJ								8 J		
Methylene Chloride	UJ										
Acetone	UJ										
Carbon Disulfide	UJ										
1,1-Dichloroethylene	11 J		12 J						9 J		9
1,1-Dichloroethane	6 J		11 J								
Total 1,2-Dichloroethylene	3900 E	4600 DE	5400 E	5600 DE	290 E	200 D	5 J		440 E	390 D	430 E
Chloroform	UJ										
1,2-Dichloroethane	UJ										
2-Butanone	UJ										
1,1,1-Trichloroethane	UJ		4 J								
Carbon Tetrachloride	UJ										
Vinyl Acetate	UJ										
Bromodichloromethane	UJ										
1,2-Dichloropropane	UJ										
Cis-1,3-Dichloropropene	UJ										
Trichloroethene	290 E	310 D	450 E	370 D	7	4 DJ			1200 E	1200 D	1200 E
Dibromochloromethane	UJ										
1,1,2-Trichlorethane	UJ										
Benzene	UJ										
Trans-1,3-Dichloropropene	UJ										
Bromoform	UJ										
4-Methyl-2-pentanone	UJ										
2-Hexanone	UJ										
Tetrachloroethene	UJ										
1,1,2,2-Tetrachloroethane	UJ										
Toluene	9 J		8 J								
Chlorobenzene	UJ										
Ethylbenzene	3 J										
Styrene	UJ										
Total Xylenes	UJ										

WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters - Volatiles	GW-11SDDDL	GW-12D	GW-12DRE	GW-12S	GW-13D	GW-13S	TB-10	VBLKW1	VBLKW2	VBLKW3	MSB
Chloromethane											
Bromomethane											
Vinyl Chloride		36 J	45 J								
Chloroethane											
Methylene Chloride		6 J	4 J								
Acetone											
Carbon Disulfide											
1,1-Dichloroethylene											58 J
1,1-Dichloroethane											
Total 1,2-Dichloroethylene	390 D	4 J	9 J	3 J	4 J						
Chloroform											
1,2-Dichloroethane											
2-Butanone											
1,1,1-Trichloroethane											
Carbon Tetrachloride											
Vinyl Acetate											
Bromodichloromethane											
1,2-Dichloropropane											
Cis-1,3-Dichloropropene											
Trichloroethene	1200 D			38							59 J
Dibromochloromethane											
1,1,2-Trichlorethane											
Benzene											58 J
Trans-1,3-Dichloropropene											
Bromoform											
4-Methyl-2-pentanone											
2-Hexanone											
Tetrachloroethene											
1,1,2,2-Tetrachloroethane											
Toluene				5		2 J					59 J
Chlorobenzene											58 J
Ethylbenzene											
Styrene											
Total Xylenes											

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WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587 **All results reported in ug/L**

Parameters - Volatiles	GW-13SMS	GW-13SMSD
Chloromethane		UJ
Bromomethane		UJ
Vinyl Chloride		UJ
Chloroethane		UJ
Methylene Chloride		UJ
Acetone		UJ
Carbon Disulfide		UJ
1,1-Dichloroethylene	40	26 J
1,1-Dichloroethane		UJ
Total 1,2-Dichloroethylene		UJ
Chloroform		UJ
1,2-Dichloroethane		UJ
2-Butanone		UJ
1,1,1-Trichloroethane		UJ
Carbon Tetrachloride		UJ
Vinyl Acetate		UJ
Bromodichloromethane		UJ
1,2-Dichloropropane		UJ
Cis-1,3-Dichloropropene		UJ
Trichloroethene	62	39 J
Dibromochloromethane		UJ
1,1,2-Trichlorethane		UJ
Benzene	68	42 J
Trans-1,3-Dichloropropene		UJ
Bromoform		UJ
4-Methyl-2-pentanone		UJ
2-Hexanone		UJ
Tetrachloroethene		UJ
1,1,2,2-Tetrachloroethane		UJ
Toluene	63	40 J
Chlorobenzene	66	42 J
Ethylbenzene		UJ
Styrene		UJ
Total Xylenes		UJ

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WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES 524.2/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters - Volatiles	DW-1	DW-2	DW-3	DW-4	DW-5	DW-5D	DW-6	DW-7	VBLKW1	VBLKW2	VBLKW3	VBLKW4	LFB1	LFB2
Dichlorodifluoromethane														2.1
Chloromethane														1.5
Vinyl Chloride														2.0
Bromomethane														2.0
Chloroethane														2.5
Trichlorofluoromethane														2.0
1,1-Dichloroethene													1.4	1.9
Methylene Chloride	0.6 U	0.6 U	1.4 U	1.0 U	1.2 U			0.6 U	0.6	0.7	1.1		2.1 U	2.8 U
Trans-1,2-dichloroethene													1.4	1.8
1,1-Dichloroethane													1.6	2.1
cis-1,2-dichloroethene													1.5	2.1
2,2-dichloropropane													1.3	1.8
Chloroform													1.8	2.3
Bromochloromethane													1.6	2.2
1,1,1-Trichloroethane													1.6	2.1
1,2-Dichloroethane													1.7	2.3
1,1-Dichloropropene													1.6	1.9
Carbon Tetrachloride													1.6	1.9
Benzene													1.7	2.1
1,2-Dichloropropane													1.8	2.4
Trichloroethene					2.6	2.9							1.8	2.1
Dibromomethane													1.6	2.3
Bromodichloromethane													1.5	2.1
Toluene													1.8	2.3
1,1,2-Trichloroethane													1.7	2.4
1,3-Dichloropropane													1.6	2.4
Dibromochloromethane													1.2	1.7
Tetrachloroethene													1.7	2.2
1,2-Dibromoethane													1.6	2.3
Chlorobenzene													1.7	2.1
1,1,2,2-Tetrachloroethane													1.6	2.2
Cis-1,2-Dichloropropene													1.8	2.6
Trans-1,2-dichloropropene													0.8	1.2

WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES 524.2/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Parameters - Volatiles	DW-1	DW-2	DW-3	DW-4	DW-5	DW-5D	DW-6	DW-7	VBLKW1	VBLKW2	VBLKW3	VBLKW4	LFB1	LFB2
Ethylbenzene													1.6	2.0
p-Xylene/m-Xylene													3.4	4.2
Bromoform													0.9	1.4
o-Xylene													1.7	2.0
Styrene													1.5	2.0
1,1,2,2-Tetrachloroethane													1.3	2.2
1,2,3-Trichloropropane													1.7	2.2
Isopropylbenzene													1.6	2.0
Bromobenzene													1.7	2.2
2-Chlorotoluene													1.9	1.9
n-Propylbenzene													1.7	2.1
4-Chlorotoluene													1.9	2.1
1,3,5-Trimethylbenzene													1.7	2.2
tert-Butylbenzene													1.6	2.1
1,2,4-Trimethylbenzene													1.8	2.2
sec-Butylbenzene													1.8	2.0
1,3-Dichlorobenzene													1.8	2.3
p-Isopropyltoluene													1.7	2.2
1,4-Dichlorobenzene													1.8	2.4
1,2-Dichlorobenzene													1.8	2.4
n-Butylbenzene													1.8	2.1
1,2-Dibromo-3-Chloropropane	R	R	R	R	R	R	R	R	R	R	R	R	R	R
1,2,4-Trichlorobenzene													1.7	2.2
Naphthalene													1.8	2.3
Hexachlorobutadiene													1.9	2.3
1,2,3-Trichlorobenzene													1.3	2.3

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WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES 524.2/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Parameters - Volatiles	DW-2MS	DW-2MSD	DW-7MS	DW-7MSD
Dichlorodifluoromethane			UJ	UJ
Chloromethane			UJ	UJ
Vinyl Chloride			UJ	UJ
Bromomethane			UJ	UJ
Chloroethane			UJ	UJ
Trichlorofluoromethane			UJ	UJ
1,1-Dichloroethene	10	9.5	10 J	10 J
Methylene Chloride	1.7 U	1.4 U	1.0 UJ	1.4 UJ
Trans-1,2-dichloroethene			UJ	UJ
1,1-Dichloroethane			UJ	UJ
cis-1,2-dichloroethene			UJ	UJ
2,2-dichloropropane			UJ	UJ
Chloroform			UJ	UJ
Bromochloromethane			UJ	UJ
1,1,1-Trichloroethane			UJ	UJ
1,2-Dichloroethane			UJ	UJ
1,1-Dichloropropene			UJ	UJ
Carbon Tetrachloride			UJ	UJ
Benzene	11	9.8	12 J	12 J
1,2-Dichloropropane			UJ	UJ
Trichloroethene	10	9.5	11 J	11 J
Dibromomethane			UJ	UJ
Bromodichloromethane			UJ	UJ
Toluene	11	10	13 J	13 J
1,1,2-Trichloroethane			UJ	UJ
1,3-Dichloropropane			UJ	UJ
Dibromochloromethane			UJ	UJ
Tetrachloroethene			UJ	UJ
1,2-Dibromoethane			UJ	UJ
Chlorobenzene	11	9.9	12.6 J	13 J
1,1,2,2-Tetrachloroethane			UJ	UJ
Cis-1,2-Dichloropropene			UJ	UJ
Trans-1,2-dichloropropene			UJ	UJ

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WELLSVILLE/ANDOVER LANDFILL SITE

VOLATILES 524.2/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587 **All results reported in ug/L**

Parameters - Volatiles	DW-2MS	DW-2MSD	DW-7MS	DW-7MSD
Ethylbenzene			UJ	UJ
p-Xylene/m-Xylene			UJ	UJ
Bromoform			UJ	UJ
o-Xylene			UJ	UJ
Styrene			UJ	UJ
1,1,2,2-Tetrachloroethane			UJ	UJ
1,2,3-Trichloropropane			UJ	UJ
Isopropylbenzene			UJ	UJ
Bromobenzene			UJ	UJ
2-Chlorotoluene			UJ	UJ
n-Propylbenzene			UJ	UJ
4-Chlorotoluene			UJ	UJ
1,3,5-Trimethylbenzene			UJ	UJ
tert-Butylbenzene			UJ	UJ
1,2,4-Trimethylbenzene			UJ	UJ
sec-Butylbenzene			UJ	UJ
1,3-Dichlorobenzene			UJ	UJ
p-Isopropyltoluene			UJ	UJ
1,4-Dichlorobenzene			UJ	UJ
1,2-Dichlorobenzene			UJ	UJ
n-Butylbenzene			UJ	UJ
1,2-Dibromo-3-Chloropropane	R	R	R	R
1,2,4-Trichlorobenzene			UJ	UJ
Naphthalene			UJ	UJ
Hexachlorobutadiene			UJ	UJ
1,2,3-Trichlorobenzene			UJ	UJ

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WELLSVILLE/ANDOVER LANDFILL SITE
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9103.051 **All results reported in ug/kg**

Parameters - Volatiles	TP-1	TP-1DL	TP-2	TP-3	TP-4	TP-5	VBLKM1	VBLKS1	TP-2MS	TP-2MSD	MSB
Chloromethane		UJ									
Bromomethane		UJ									
Vinyl Chloride	2900 E	980 DJ									
Chloroethane		UJ									
Methylene Chloride	1900 U	2000 U	7 U	1400 U	850 U	110	550 J	4 J	10 U	10 U	6 U
Acetone	3100 E	4500 DJ	230 J	1800 J		370 J			360 J	250 E	4 J
Carbon Disulfide		UJ									
1,1-Dichloroethylene		UJ								54	22
1,1-Dichloroethane	710	UJ									
Total 1,2-Dichloroethylene	5400 E	3900 DJ		2200	2900	21 J					
Chloroform		UJ									
1,2-Dichloroethane		UJ							4 J		
2-Butanone	490 J	UJ				75 J			21 J	20 J	
1,1,1-Trichloroethane		UJ									
Carbon Tetrachloride		UJ									
Vinyl Acetate		UJ									
Bromodichloromethane		UJ									
1,2-Dichloropropane		UJ									
Cis-1,3-Dichloropropene		UJ									
Trichloroethene	73	UJ			5300				62	59	52
Dibromochloromethane		UJ									
1,1,2-Trichlorethane		UJ									
Benzene	UJ	UJ	UJ	UJ	UJ	78 J			66 J	63 J	53
Trans-1,3-Dichloropropene		UJ									
Bromoform		UJ									
4-Methyl-2-pentanone	260 J	UJ							UJ		
2-Hexanone	120	UJ				44 J			UJ		
Tetrachloroethene		UJ			520 J				UJ		
1,1,2,2-Tetrachloroethane		UJ							UJ		
Toluene	970 J	1200 D	11 J	760 J	3200 J	33 J			90 J	64 J	51
Chlorobenzene	UJ	UJ	UJ	UJ	UJ	UJ			64 J	64 J	54
Ethylbenzene	1800 J	33000 D	31 J	12000 J	830 J	1200 J			80 J	16 J	
[illegible]rene	45	UJ			4200				UJ		
[illegible]al Xylenes	1700 J	UJ	51 J	[illegible] J	690 J	350 J			130 J	28 J	

DATA SUMMARY TABLES

SEMI-VOLATILE ORGANICS

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.123

All results reported in ug/kg

Parameters - SemiVolatiles	SB-1A	SB-1B	SB-6A	SB-6B	SBLKS1	SBLKS2	SBLKS3	MSB	SB-6A-MS	SB-6A-MSD
Phenol			UJ	UJ				6400 E	5500 J	4900 J
bis(2-chloroethyl) ether			UJ	UJ					UJ	UJ
2-Chlorophenol			UJ	UJ				5100	4500 J	4100 J
1,3-Dichlorobenzene			UJ	UJ					UJ	UJ
1,4-Dichlorobenzene			UJ	UJ				3000	2700 J	2200 J
Benzyl Alcohol			UJ	UJ					UJ	UJ
1,2-Dichlorobenzene			UJ	UJ					UJ	UJ
2-Methylphenol			UJ	UJ					UJ	UJ
2,2-oxybis(1-chloropriopane)			UJ	UJ					UJ	UJ
4-methylphenol			UJ	UJ					UJ	UJ
N-Nitroso-di-n-propylamine			UJ	UJ				3100	2700 J	2300 J
Hexachloroethane			UJ	UJ					UJ	UJ
Nitrobenzene			UJ	UJ					UJ	UJ
Isophorone			UJ	UJ					UJ	UJ
2-Nitrophenol			UJ	UJ					UJ	UJ
2,4-Dimethylphenol			UJ	UJ					UJ	UJ
Benzoic Acid			UJ	UJ					UJ	UJ
bis(2-chloroethoxy)methane			UJ	UJ					UJ	UJ
2,4-Dichlorophenol			UJ	UJ					UJ	UJ
1,2,4-Trichlorobenzene			UJ	UJ				3000	2400 J	2300 J
Naphthalene			UJ	UJ					UJ	UJ
4-chloroaniline			UJ	UJ					UJ	UJ
Hexachlorobutadiene			UJ	UJ					UJ	UJ
4-chloro-3-methylphenol			UJ	UJ				5600 E	4700 J	4600 J
2-methylnaphthalene			UJ	UJ					UJ	UJ
Hexachlorocyclopentadiene			UJ	UJ					UJ	UJ
2,4,6-Trichlorophenol			UJ	UJ					UJ	UJ
2,4,5-Trichlorophenol			UJ	UJ					UJ	UJ
2-Chloronaphthalene			UJ	UJ					UJ	UJ
2-Nitroaniline			UJ	UJ					UJ	UJ
Dimethylphthalate			UJ	UJ					UJ	UJ
naphthylene			UJ	U					UJ	UJ

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.123 **All results reported in ug/kg**

Parameters - SemiVolatiles	SB-1A	SB-1B	SB-6A	SB-6B	SBLKS1	SBLKS2	SBLKS3	MSB	SB-6A-MS	SB-6A-MSD
2,6-Dinitrotoluene			UJ	UJ					UJ	UJ
3-Nitroaniline			UJ	UJ					UJ	UJ
Acenaphthene			UJ	UJ				3100	2400 J	2400 J
2,4-Dinitrophenol			UJ	UJ					UJ	UJ
4-Nitrophenol			UJ	UJ				8300 E	5500 J	6000 E
Dibenzofuran			UJ	UJ					UJ	UJ
2,4-Dinitrotoluene			UJ	UJ				3900	2700 J	2700 J
Diethylphthalate			UJ	UJ					UJ	UJ
4-chlorophenyl-phenylether			UJ	UJ					UJ	UJ
Fluorene			UJ	UJ					UJ	UJ
4-Nitroaniline			UJ	UJ					UJ	UJ
4,6-Dinitro-2-methylphenol			UJ	UJ					UJ	UJ
N-Nitrosodiphenylamine			UJ	UJ					UJ	UJ
4-Bromophenyl-phenylether			UJ	UJ					UJ	UJ
Hexachlorobenzene			UJ	UJ					UJ	UJ
Pentachlorophenol			UJ	UJ				5300	4300 UJ	4500 J
Phenanthrene			UJ	UJ					UJ	UJ
Anthracene			UJ	UJ					UJ	UJ
Di-n-butylphthalate			UJ	UJ					UJ	UJ
Fluoranthene			UJ	UJ					UJ	UJ
Pyrene			UJ	UJ				2900	2400 J	2300 J
Butylbenzylphthalate			UJ	UJ					UJ	UJ
3,3'-Dichlorobenzidine			UJ	UJ					UJ	UJ
Benz(a)anthracene			UJ	UJ					UJ	UJ
Chrysene			UJ	UJ					UJ	UJ
bis(2-ethylhexyl)phthalate	360 U		360 UJ	400 UJ	46 J				360 UJ	UJ
Di-n-octyl phthalate			UJ	UJ					UJ	UJ
Benzo(b)flouranthene			UJ	UJ					UJ	UJ
Benzo(k)flouranthene			UJ	UJ					UJ	UJ
Benzo(a)pyrene			UJ	UJ					UJ	UJ
Indeno(1,2,3-cd)pyrene			UJ	UJ					UJ	UJ
Dibenz(a,h)anthracene			UJ	UJ					UJ	UJ
Benzo(g,h,i)perylene			UJ	UJ					UJ	UJ

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/L**

Parameters - Semi-Volatiles	DW-1	R-1	SBLKW1	DW-1-MS
Phenol				39
bis (2-chloroethyl) ether				
2-Chlorophenol				70
1,3-Dichlorobenzene				
1,4-Dichlorobenzene				67
Benzyl Alcohol				
1,2-Dichlorobenzene				
2-Methylphenol				
2,2-oxybis(1-chloropriopane)				
4-methylphenol				
N-Nitroso-di-n-propylamine				78
Hexachloroethane				
Nitrobenzene				
Isophorone				
2-Nitrophenol				
2,4-Dimethylphenol				
Benzoic Acid				
bis(2-chloroethoxy)methane				
2,4-Dichlorophenol				
1,2,4-Trichlorobenzene				67
Naphthalene				
4-chloroaniline				
Hexachlorobutadiene				
4-chloro-3-methylphenol				110
2-methylnaphthalene				
Hexachlorocyclopentadiene				UJ
2,4,6-Trichlorophenol				UJ
2,4,5-Trichlorophenol				UJ
2-Chloronaphthalene				UJ
2-Nitroaniline				UJ
Dimethylphthalate				UJ
Acenaphthylene				UJ

WELLSVILLE/ANDOVER LANDFILL SITE
SEMI-VOLATILES/WATER - DATA SUMMARY
(continued)

CASE NO. 9102.282 **All results reported in ug/L**

Parameters - Semi-Volatiles	DW-1	R-1	SBLKW1	DW-1-MS
2,6-Dinitrotoluene				UJ
3-Nitroaniline				UJ
Acenaphthene				73 J
2,4-Dinitrophenol				UJ
4-Nitrophenol				UJ
Dibenzofuran				UJ
2,4-Dinitrotoluene				86 J
Diethylphthalate				UJ
4-chlorophenyl-phenylether				UJ
Fluorene				UJ
4-Nitroaniline				UJ
4,6-Dinitro-2-methylphenol				UJ
N-Nitrosodiphenylamine				UJ
4-Bromophenyl-phenylether				UJ
Hexachlorobenzene				UJ
Pentachlorophenol				4 J
Phenanthrene				UJ
Anthracene				UJ
Di-n-butylphthalate				UJ
Fluoranthene				UJ
Pyrene	UJ			82 J
Butylbenzylphthalate	UJ			UJ
3,3'-Dichlorobenzidine	UJ			UJ
Benz(a)anthracene	UJ			UJ
Chrysene	UJ			UJ
bis(2-ethylhexyl)phthalate	UJ			UJ
Di-n-octyl phthalate	UJ			UJ
Benzo(b)flouranthene	UJ			UJ
Benzo(k)flouranthene	UJ			UJ
Benzo(a)pyrene	UJ			UJ
Indeno(1,2,3-cd)pyrene	UJ			UJ
Dibenz(a,h)anthracene	UJ			UJ
Benzo(g,h,i)perylene	UJ			UJ

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/kg**

Parameters - Semi-Volatiles	SB-8A	SB-8AD	SB-8B	SBLKS1	MSB
Phenol					5400 E
bis (2-chloroethyl) ether					
2-Chlorophenol					5000
1,3-Dichlorobenzene					
1,4-Dichlorobenzene					2700
Benzyl Alcohol					
1,2-Dichlorobenzene					
2-Methylphenol					
2,2-oxybis(1-chloropriopane)					
4-methylphenol					
N-Nitroso-di-n-propylamine					2900
Hexachloroethane					
Nitrobenzene					
Isophorone					
2-Nitrophenol					
2,4-Dimethylphenol					
Benzoic Acid					
bis(2-chloroethoxy)methane					
2,4-Dichlorophenol					
1,2,4-Trichlorobenzene					2500
Naphthalene					
4-chloroaniline					
Hexachlorobutadiene					
4-chloro-3-methylphenol					4800
2-methylnaphthalene					
Hexachlorocyclopentadiene					
2,4,6-Trichlorophenol					
2,4,5-Trichlorophenol					
2-Chloronaphthalene					
2-Nitroaniline					
Dimethylphthalate					
Acenaphthylene					

WELLSVILLE/ANDOVER LANDFILL SITE
SEMI-VOLATILES/SOIL - DATA SUMMARY
(continued)

CASE NO. 9102.282 **All results reported in ug/kg**

Parameters - Semi-Volatiles	SB-8A	SB-8AD	SB-8B	SBLKS1	MSB
2,6-Dinitrotoluene					
3-Nitroaniline					
Acenaphthene					2400
2,4-Dinitrophenol					
4-Nitrophenol					5500
Dibenzofuran					
2,4-Dinitrotoluene					3000
Diethylphthalate					
4-chlorophenyl-phenylether					
Fluorene					
4-Nitroaniline					
4,6-Dinitro-2-methylphenol					
N-Nitrosodiphenylamine					
4-Bromophenyl-phenylether					
Hexachlorobenzene					
Pentachlorophenol					3900
Phenanthrene					
Anthracene					
Di-n-butylphthalate					
Fluoranthene					
Pyrene					2300
Butylbenzylphthalate					
3,3'-Dichlorobenzidine					
Benz(a)anthracene					
Chrysene					
bis(2-ethylhexyl)phthalate	360 U	370 U	380 U	24 J	
Di-n-octyl phthalate					
Benzo(b)flouranthene					
Benzo(k)flouranthene					
Benzo(a)pyrene					
Indeno(1,2,3-cd)pyrene					
Dibenz(a,h)anthracene					
Benzo(g,h,i)perylene					

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/kg

Parameters - SemiVolatiles	SB-7A	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-5RE	SED-6
Phenol										
bis (2-chloroethyl) ether										
2-Chlorophenol										
1,3-Dichlorobenzene										
1,4-Dichlorobenzene										
Benzyl Alcohol										
1,2-Dichlorobenzene										
2-Methylphenol										
2,2-oxybis(1-chloropriopane)										
4-methylphenol										
N-Nitroso-di-n-propylamine										
Hexachloroethane										
Nitrobenzene										
Isophorone										
2-Nitrophenol										
2,4-Dimethylphenol										
Benzoic Acid										
bis(2-chloroethoxy)methane										
2,4-Dichlorophenol										
1,2,4-Trichlorobenzene										
Naphthalene										
4-chloroaniline										
Hexachlorobutadiene										
4-chloro-3-methylphenol										
2-methylnaphthalene										
Hexachlorocyclopentadiene										
2,4,6-Trichlorophenol										
2,4,5-Trichlorophenol										
2-Chloronaphthalene										
2-Nitroaniline										
Dimethylphthalate										
A[illegible]naphthylene										

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.387

All results reported in ug/kg

Parameters - SemiVolatiles	SB-7A	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-5RE	SED-6
2,6-Dinitrotoluene										
3-Nitroaniline										
Acenaphthene										
2,4-Dinitrophenol										
4-Nitrophenol										
Dibenzofuran										
2,4-Dinitrotoluene										
Diethylphthalate										
4-chlorophenyl-phenylether										
Fluorene										
4-Nitroaniline										
4,6-Dinitro-2-methylphenol										
N-Nitrosodiphenylamine										
4-Bromophenyl-phenylether										
Hexachlorobenzene										
Pentachlorophenol										
Phenanthrene										
Anthracene										
Di-n-butylphthalate	370 U	350 U	510 U	520 U	420 U	620 U	670 U	400 U	400 U	430 U
Fluoranthene										
Pyrene										
Butylbenzylphthalate					24 J					
3,3'-Dichlorobenzidine										
Benz(a)anthracene										
Chrysene										
bis(2-ethylhexyl)phthalate	370 U	350 U	510 U	520 U	420 U	620 U	670 U	400 U	400 U	430 U
Di-n-octyl phthalate								UJ	UJ	
Benzo(b)flouranthene								UJ	UJ	
Benzo(k)flouranthene								UJ	UJ	
Benzo(a)pyrene								UJ	UJ	
Indeno(1,2,3-cd)pyrene								UJ	UJ	
Dibenz(a,h)anthracene								UJ	UJ	
Benzo(g,h,i)perylene								UJ	UJ	

WELLSVILLE/ANDOVER LANDFILL SITE
SEMI-VOLATILES/SOIL - DATA SUMMARY
(continued)

CASE NO. 9102.387

All results reported in ug/kg

Parameters - SemiVolatiles	SBLKS1	SED-4MS	SED-4MSD
Phenol		8600 E	13000 E
bis (2-chloroethyl) ether			
2-Chlorophenol		7700 E	12000 E
1,3-Dichlorobenzene			
1,4-Dichlorobenzene		3500	5400 E
Benzyl Alcohol			
1,2-Dichlorobenzene			
2-Methylphenol			
2,2-oxybis(1-chloropriopane)			
4-methylphenol			
N-Nitroso-di-n-propylamine		4400	7200 E
Hexachloroethane			
Nitrobenzene			
Isophorone			
2-Nitrophenol			
2,4-Dimethylphenol			
Benzoic Acid			
bis(2-chloroethoxy)methane			
2,4-Dichlorophenol			
1,2,4-Trichlorobenzene		3800	5000
Naphthalene			
4-chloroaniline			
Hexachlorobutadiene			
4-chloro-3-methylphenol		6900 E	11000 E
2-methylnaphthalene			
Hexachlorocyclopentadiene			
2,4,6-Trichlorophenol			
2,4,5-Trichlorophenol			
2-Chloronaphthalene			
2-Nitroaniline			
Dimethylphthalate			
Acenaphthylene			

WELLSVILLE/ANDOVER LANDFILL SITE
SEMI-VOLATILES/SOIL - DATA SUMMARY
(continued)

CASE NO. 9102.387 **All results reported in ug/kg**

Parameters - SemiVolatiles	SBLKS1	SED-4MS	SED-4MSD
2,6-Dinitrotoluene			
3-Nitroaniline			
Acenaphthene		3600	4900
2,4-Dinitrophenol			
4-Nitrophenol		7600 E	21000 E
Dibenzofuran			
2,4-Dinitrotoluene		4400	6500 E
Diethylphthalate			
4-chlorophenyl-phenylether			
Fluorene			
4-Nitroaniline			
4,6-Dinitro-2-methylphenol			
N-Nitrosodiphenylamine			
4-Bromophenyl-phenylether			
Hexachlorobenzene			
Pentachlorophenol		6700 E	15000 E
Phenanthrene			
Anthracene			
Di-n-butylphthalate	31 J	620 U	620 U
Fluoranthene			
Pyrene		5500 E	5400 E
Butylbenzylphthalate			
3,3'-Dichlorobenzidine			
Benz(a)anthracene			
Chrysene			
bis(2-ethylhexyl)phthalate	88 J	620 U	620 U
Di-n-octyl phthalate			
Benzo(b)flouranthene			
Benzo(k)flouranthene			
Benzo(a)pyrene			
Indeno(1,2,3-cd)pyrene			
Dibenz(a,h)anthracene			
Benzo(g,h,i)perylene			

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/L

Parameters - Semi-Volatiles	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	SBLKW1	SBLKW2	SBLKW3	MSB	SW-4MS	SW-4MSD
Phenol											61	34	32
bis(2-chloroethyl) ether													
2-Chlorophenol											110	66	70
1,3-Dichlorobenzene													
1,4-Dichlorobenzene											48	40	35
Benzyl Alcohol													
1,2-Dichlorobenzene													
2-Methylphenol													
2,2-oxybis(1-chloropriopane)													
4-methylphenol													
N-Nitroso-di-n-propylamine											54	50	49
Hexachloroethane													
Nitrobenzene													
Isophorone													
2-Nitrophenol													
2,4-Dimethylphenol													
Benzoic Acid													
bis(2-chloroethoxy)methane													
2,4-Dichlorophenol													
1,2,4-Trichlorobenzene											54	44	41
Naphthalene													
4-chloroaniline													
Hexachlorobutadiene													
4-chloro-3-methylphenol											130	120	120
2-methylnaphthalene													
Hexachlorocyclopentadiene													
2,4,6-Trichlorophenol													
2,4,5-Trichlorophenol													
2-Chloronaphthalene													
2-Nitroaniline													
Dimethylphthalate													
Acen thylene													

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.387

All results reported in ug/L

Parameters - Semi-Volatiles	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	SBLKW1	SBLKW2	SBLKW3	MSB	SW-4MS	SW-4MSD
2,6-Dinitrotoluene													
3-Nitroaniline													
Acenaphthene											62	57	56
2,4-Dinitrophenol													
4-Nitrophenol											53		15 J
Dibenzofuran													
2,4-Dinitrotoluene											78	77	78
Diethylphthalate													
4-chlorophenyl-phenylether													
Fluorene													
4-Nitroaniline													
4,6-Dinitro-2-methylphenol													
N-Nitrosodiphenylamine													
4-Bromophenyl-phenylether													
Hexachlorobenzene													
Pentachlorophenol											84	11 J	26 J
Phenanthrene													
Anthracene													
Di-n-butylphthalate	2 J	1 J		2 J			1 J					1 J	2 J
Fluoranthene													
Pyrene											87	81	72
Butylbenzylphthalate													
3,3'-Dichlorobenzidine													
Benz(a)anthracene													
Chrysene													
bis(2-ethylhexyl)phthalate	10 U	10 U	10 U	10 U	10 U		10 U	2 J	2 J		10 U	10 U	10 U
Di-n-octyl phthalate		2 J											
Benzo(b)flouranthene													
Benzo(k)flouranthene													
Benzo(a)pyrene													
Indeno(1,2,3-cd)pyrene													
Dibenz(a,h)anthracene													
Benzo(g,h,i)perylene													

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/kg

Parameters - SemiVolatiles	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-9RE	SS-10
Phenol											
bis (2-chloroethyl) ether											
2-Chlorophenol											
1,3-Dichlorobenzene											
1,4-Dichlorobenzene											
Benzyl Alcohol											
1,2-Dichlorobenzene											
2-Methylphenol											
2,2-oxybis(1-chloropriopane)											
4-methylphenol											
N-Nitroso-di-n-propylamine											
Hexachloroethane											
Nitrobenzene											
Isophorone											
2-Nitrophenol											
2,4-Dimethylphenol											
Benzoic Acid											
bis(2-chloroethoxy)methane											
2,4-Dichlorophenol											
1,2,4-Trichlorobenzene											
Naphthalene											
4-chloroaniline											
Hexachlorobutadiene											
4-chloro-3-methylphenol											
2-methylnaphthalene											
Hexachlorocyclopentadiene											
2,4,6-Trichlorophenol											
2,4,5-Trichlorophenol											
2-Chloronaphthalene											
2-Nitroaniline											
Dimethylphthalate											
Acenap[illegible]lene											

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Parameters - SemiVolatiles	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-9RE	SS-10
2,6-Dinitrotoluene											
3-Nitroaniline											
Acenaphthene											
2,4-Dinitrophenol											
4-Nitrophenol											
Dibenzofuran											
2,4-Dinitrotoluene											
Diethylphthalate											
4-chlorophenyl-phenylether											
Fluorene											
4-Nitroaniline											
4,6-Dinitro-2-methylphenol									UJ		
N-Nitrosodiphenylamine									UJ		
4-Bromophenyl-phenylether									UJ		
Hexachlorobenzene									UJ		
Pentachlorophenol									UJ		
Phenanthrene							46 J		UJ		94 J
Anthracene									UJ		27 J
Di-n-butylphthalate	420 U	410 U	570 U	370 U	420 U	420 U	450 U	420 U	850 UJ	420 U	820 U
Fluoranthene							55 J				370 J
Pyrene			53 J				59 J		UJ		280 J
Butylbenzylphthalate									UJ		
3,3'-Dichlorobenzidine									UJ		
Benz(a)anthracene									UJ		
Chrysene									40 J		100 J
bis(2-ethylhexyl)phthalate	420 U	410 U	2100	370 U	420 U	420 U	450 U	420 U	850 UJ	420 U	820 U
Di-n-octyl phthalate									UJ	UJ	
Benzo(b)flouranthene									UJ	UJ	67 J
Benzo(k)flouranthene									UJ	UJ	44 J
Benzo(a)pyrene									UJ	UJ	
Indeno(1,2,3-cd)pyrene									UJ	UJ	
Dibenz(a,h)anthracene									UJ	UJ	
Benzo(g,h,i)perylene									UJ	UJ	

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/kg

Parameters - SemiVolatiles	SS-10D	SS-11	SS-12	SS-12RE	SS-13	SS-13RE	SS-14	SS-14RE	SBLKS1	SS-11MS	SS-11MSD	MSB
Phenol										11000 E	12000 E	5200 E
bis(2-chloroethyl) ether												
2-Chlorophenol										11000 E	11000 E	4800 E
1,3-Dichlorobenzene												
1,4-Dichlorobenzene										4400	4500	2300
Benzyl Alcohol												
1,2-Dichlorobenzene												
2-Methylphenol												
2,2-oxybis(1-chloropriopane)												
4-methylphenol												
N-Nitroso-di-n-propylamine										4700	5100	2900 E
Hexachloroethane												
Nitrobenzene								UJ				
Isophorone								UJ				
2-Nitrophenol								UJ				
2,4-Dimethylphenol								UJ				
Benzoic Acid								UJ				
bis(2-chloroethoxy)methane								UJ				
2,4-Dichlorophenol								UJ				
1,2,4-Trichlorobenzene								UJ		5600	5600	2300
Naphthalene								UJ				
4-chloroaniline								UJ				
Hexachlorobutadiene								UJ				
4-chloro-3-methylphenol								UJ		10000 E	10000 E	4300 E
2-methylnaphthalene								UJ				
Hexachlorocyclopentadiene												
2,4,6-Trichlorophenol												
2,4,5-Trichlorophenol												
2-Chloronaphthalene												
2-Nitroaniline												
Dimethylphthalate												
Acenaphthy												

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Parameters - SemiVolatiles	SS-10D	SS-11	SS-12	SS-12RE	SS-13	SS-13RE	SS-14	SS-14RE	SBLKS1	SS-11MS	SS-11MSD	MSB
2,6-Dinitrotoluene												
3-Nitroaniline												
Acenaphthene										5500	5200	2200
2,4-Dinitrophenol												
4-Nitrophenol										10000 E	9400 E	5900 E
Dibenzofuran												
2,4-Dinitrotoluene										5900 E	5400	3000 E
Diethylphthalate												
4-chlorophenyl-phenylether												
Fluorene												
4-Nitroaniline												
4,6-Dinitro-2-methylphenol							UJ			UJ	UJ	
N-Nitrosodiphenylamine							UJ			UJ	UJ	
4-Bromophenyl-phenylether							UJ			UJ	UJ	
Hexachlorobenzene							UJ			UJ	UJ	
Pentachlorophenol							UJ			5100 J	3500 J	6500 E
Phenanthrene							41 J	26 J		UJ	UJ	
Anthracene							UJ			UJ	UJ	
Di-n-butylphthalate	440 U	720 U	450 U	450 U		880 U	490 UJ	490 UJ	29 J	UJ	720 UJ	330 U
Fluoranthene							42 J	25 J		UJ	UJ	
Pyrene			UJ	UJ	UJ	UJ	49 J	49 J		6800 E	8200 E	2900 E
Butylbenzylphthalate	50 J		UJ	UJ	UJ	260 J	UJ	UJ		UJ	UJ	
3,3'-Dichlorobenzidine			UJ	UJ	UJ	UJ	UJ	UJ		UJ	UJ	
Benz(a)anthracene			UJ	UJ	UJ	UJ	UJ	UJ		UJ	UJ	
Chrysene			UJ	UJ	UJ	UJ	48 J	32 J		UJ	UJ	
bis(2-ethylhexyl)phthalate	440 U	720 U	450 UJ	450 UJ	440 UJ	880 UJ	490 UJ	490 UJ	99 J	720 UJ	720 UJ	330 U
Di-n-octyl phthalate			UJ	UJ	UJ	UJ	UJ	UJ		UJ	UJ	
Benzo(b)flouranthene			UJ	UJ	UJ	UJ	140 J	77 J		UJ	UJ	
Benzo(k)flouranthene			UJ	UJ	UJ	UJ	UJ	UJ		UJ	UJ	
Benzo(a)pyrene			UJ	UJ	UJ	UJ	88 J	67 J		UJ	UJ	
Indeno(1,2,3-cd)pyrene			UJ	45 J	UJ	UJ	UJ	UJ		UJ	UJ	
Dibenz(a,h)anthracene			UJ	44 J	UJ	UJ	UJ	UJ		UJ	UJ	
Benzo(g,h,i)perylene			UJ	47 J	UJ	UJ	UJ	UJ		UJ	UJ	

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/L

Parameters - Semi-Volatiles	(MH-4) L-1	(PS2) L-2	SBLKW1	PS2(L2) MS	PS2(L2) MSD	MSB1
Phenol				71	70	72
bis (2-chloroethyl) ether						
2-Chlorophenol				140	130	140
1,3-Dichlorobenzene						
1,4-Dichlorobenzene		1 J		62	62	66
Benzyl Alcohol						
1,2-Dichlorobenzene						
2-Methylphenol						
2,2-oxybis(1-chloropriopane)						
4-methylphenol						
N-Nitroso-di-n-propylamine				62	62 J	68
Hexachloroethane						
Nitrobenzene						
Isophorone						
2-Nitrophenol						
2,4-Dimethylphenol						
Benzoic Acid						
bis(2-chloroethoxy)methane						
2,4-Dichlorophenol						
1,2,4-Trichlorobenzene				63	70	66
Naphthalene		1 J				
4-chloroaniline						
Hexachlorobutadiene						
4-chloro-3-methylphenol		4 J		150	150	140
2-methylnaphthalene						
Hexachlorocyclopentadiene						
2,4,6-Trichlorophenol						
2,4,5-Trichlorophenol						
2-Chloronaphthalene						
2-Nitroaniline						
Dimethylphthalate						
Acenaphthylene						

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/L

Parameters - Semi-Volatiles	(MH-4) L-1	(PS2) L-2	SBLKW1	PS2(L2) MS	PS2(L2) MSD	MSB1
2,6-Dinitrotoluene						
3-Nitroaniline						
Acenaphthene				66	65	68
2,4-Dinitrophenol						
4-Nitrophenol				88	92	78
Dibenzofuran						
2,4-Dinitrotoluene				71	73	90
Diethylphthalate						
4-chlorophenyl-phenylether						
Fluorene						
4-Nitroaniline						
4,6-Dinitro-2-methylphenol						
N-Nitrosodiphenylamine		1 J				
4-Bromophenyl-phenylether						
Hexachlorobenzene						
Pentachlorophenol				30 J	20 J	140
Phenanthrene						
Anthracene						
Di-n-butylphthalate		2 J				
Fluoranthene						
Pyrene				84	87	87
Butylbenzylphthalate						
3,3'-Dichlorobenzidine						
Benz(a)anthracene						
Chrysene						
bis(2-ethylhexyl)phthalate	10 U	10 U	2 J			
Di-n-octyl phthalate						
Benzo(b)flouranthene						
Benzo(k)flouranthene						
Benzo(a)pyrene						
Indeno(1,2,3-cd)pyrene						
Dibenz(a,h)anthracene						
Benzo(g,h,i)perylene						

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.556

All results reported in ug/L

Parameters - Semi-Volatiles	GW-1D	GW-2D	GW-2DRE	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-10D	GW-10S	GW-10SRE
Phenol		R	R				UJ			R	R
bis (2-chloroethyl) ether			UJ				UJ				UJ
2-Chlorophenol		R	R				UJ			R	R
1,3-Dichlorobenzene			UJ				UJ				UJ
1,4-Dichlorobenzene			UJ				UJ				UJ
Benzyl Alcohol			UJ				UJ				UJ
1,2-Dichlorobenzene			UJ				UJ				UJ
2-Methylphenol		R	R				UJ			R	R
2,2-oxybis(1-chloropriopane)			UJ				UJ				UJ
4-methylphenol		R	R				UJ			R	R
N-Nitroso-di-n-propylamine			UJ				UJ				UJ
Hexachloroethane			UJ				UJ				UJ
Nitrobenzene			UJ				UJ				UJ
Isophorone			UJ				UJ				UJ
2-Nitrophenol		R	R				UJ			R	R
2,4-Dimethylphenol		R	R				UJ			R	R
Benzoic Acid			UJ				UJ				UJ
bis(2-chloroethoxy)methane			UJ				UJ				UJ
2,4-Dichlorophenol		R	R				UJ			R	R
1,2,4-Trichlorobenzene			UJ				UJ				UJ
Naphthalene			UJ				UJ				UJ
4-chloroaniline			UJ				UJ				UJ
Hexachlorobutadiene			UJ				UJ				UJ
4-chloro-3-methylphenol		R	R				UJ			R	R
2-methylnaphthalene			UJ				UJ				UJ
Hexachlorocyclopentadiene			UJ				UJ				UJ
2,4,6-Trichlorophenol		R	R				UJ			R	R
2,4,5-Trichlorophenol		R	R				UJ			R	R
2-Chloronaphthalene			UJ				UJ				UJ
2-Nitroaniline			UJ				UJ				UJ
Dimethylphthalate			UJ				UJ				UJ
Acenaphthylene			UJ				UJ				UJ

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.556

All results reported in ug/L

Parameters - Semi-Volatiles	GW-1D	GW-2D	GW-2DRE	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-10D	GW-10S	GW-10SRE
2,6-Dinitrotoluene			UJ				UJ				UJ
3-Nitroaniline			UJ				UJ				UJ
Acenaphthene			UJ				UJ				UJ
2,4-Dinitrophenol		R	R				UJ			R	R
4-Nitrophenol		R	R				UJ			R	R
Dibenzofuran			UJ				UJ				UJ
2,4-Dinitrotoluene			UJ				UJ				UJ
Diethylphthalate			UJ				UJ				UJ
4-chlorophenyl-phenylether			UJ				UJ				UJ
Fluorene			UJ				UJ				UJ
4-Nitroaniline			UJ				UJ				UJ
4,6-Dinitro-2-methylphenol		R	R				UJ			R	R
N-Nitrosodiphenylamine			UJ				UJ				UJ
4-Bromophenyl-phenylether			UJ				UJ				UJ
Hexachlorobenzene			UJ				UJ				UJ
Pentachlorophenol		R	R				UJ			R	R
Phenanthrene			UJ				UJ				UJ
Anthracene			UJ				UJ				UJ
Di-n-butylphthalate			UJ				UJ				UJ
Fluoranthene			UJ				UJ				UJ
Pyrene			UJ				UJ				UJ
Butylbenzylphthalate			UJ				UJ				UJ
3,3'-Dichlorobenzidine			UJ				UJ				UJ
Benz(a)anthracene			UJ				UJ				UJ
Chrysene			UJ				UJ				UJ
bis(2-ethylhexyl)phthalate			UJ				UJ				UJ
Di-n-octyl phthalate			UJ				UJ				UJ
Benzo(b)flouranthene			UJ				UJ				UJ
Benzo(k)flouranthene			UJ				UJ				UJ
Benzo(a)pyrene			UJ				UJ				UJ
Indeno(1,2,3-cd)pyrene			UJ				UJ				UJ
Dibenz(a,h)anthracene			UJ				UJ				UJ
Benzo(g,h,i)perylene			UJ				UJ				UJ

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.556

All results reported in ug/L

Parameters - Semi-Volatiles	SBLKW1	SBLKW2	GW-10DMS	GW-10DMSD
Phenol			56	52
bis (2-chloroethyl) ether				
2-Chlorophenol			110	97
1,3-Dichlorobenzene				
1,4-Dichlorobenzene			45	48
Benzyl Alcohol				
1,2-Dichlorobenzene				
2-Methylphenol				
2,2-oxybis(1-chloropriopane)				
4-methylphenol				
N-Nitroso-di-n-propylamine			49	49
Hexachloroethane				
Nitrobenzene				
Isophorone				
2-Nitrophenol				
2,4-Dimethylphenol				
Benzoic Acid				
bis(2-chloroethoxy)methane				
2,4-Dichlorophenol				
1,2,4-Trichlorobenzene			47	51
Naphthalene				
4-chloroaniline				
Hexachlorobutadiene				
4-chloro-3-methylphenol			110	110
2-methylnaphthalene				
Hexachlorocyclopentadiene				
2,4,6-Trichlorophenol				
2,4,5-Trichlorophenol				
2-Chloronaphthalene				
2-Nitroaniline				
Dimethylphthalate				
Acenaphthylene				

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.556

All results reported in ug/L

Parameters - Semi-Volatiles	SBLKW1	SBLKW2	GW-10DMS	GW-10DMSD
2,6-Dinitrotoluene				
3-Nitroaniline				
Acenaphthene			58	58
2,4-Dinitrophenol				
4-Nitrophenol			31 J	20 J
Dibenzofuran				
2,4-Dinitrotoluene			65	65
Diethylphthalate				
4-chlorophenyl-phenylether				
Fluorene				
4-Nitroaniline				
4,6-Dinitro-2-methylphenol				
N-Nitrosodiphenylamine				
4-Bromophenyl-phenylether				
Hexachlorobenzene				
Pentachlorophenol			66	52
Phenanthrene				
Anthracene				
Di-n-butylphthalate				
Fluoranthene				
Pyrene			72	66
Butylbenzylphthalate				
3,3'-Dichlorobenzidine				
Benz(a)anthracene				
Chrysene				
bis(2-ethylhexyl)phthalate				
Di-n-octyl phthalate				
Benzo(b)flouranthene				
Benzo(k)flouranthene				
Benzo(a)pyrene				
Indeno(1,2,3-cd)pyrene				
Dibenz(a,h)anthracene				
Benzo(g,h,i)perylene				

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters - Semi-Volatiles	DW-1	DW-2	DW-3	DW-4	DW-5	DW-5D	DW-6	DW-7	GW-5D	GW-5S	GW-6D	GW-6S	GW-7D	GW-11S	GW-11SDD
Phenol															R
bis (2-chloroethyl) ether															
2-Chlorophenol															R
1,3-Dichlorobenzene															
1,4-Dichlorobenzene															
Benzyl Alcohol															
1,2-Dichlorobenzene															
2-Methylphenol															R
2,2-oxybis(1-chloropriopane)															
4-methylphenol															R
N-Nitroso-di-n-propylamine															
Hexachloroethane															
Nitrobenzene															
Isophorone															
2-Nitrophenol															R
2,4-Dimethylphenol															R
Benzoic Acid															
bis(2-chloroethoxy)methane															
2,4-Dichlorophenol															R
1,2,4-Trichlorobenzene															
Naphthalene															
4-chloroaniline															
Hexachlorobutadiene															
4-chloro-3-methylphenol															R
2-methylnaphthalene															
Hexachlorocyclopentadiene															
2,4,6-Trichlorophenol															R
2,4,5-Trichlorophenol															R
2-Chloronaphthalene															
2-Nitroaniline															
Dimethylphthalate															
Acenaphthene															

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (cont.)

CASE NO. 9102.587

All results reported in ug/L

Parameters - Semi-Volatiles	DW-1	DW-2	DW-3	DW-4	DW-5	DW-5D	DW-6	DW-7	GW-5D	GW-5S	GW-6D	GW-6S	GW-7D	GW-11S	GW-11SDD
2,6-Dinitrotoluene															
3-Nitroaniline															
Acenaphthene															
2,4-Dinitrophenol															R
4-Nitrophenol															R
Dibenzofuran															
2,4-Dinitrotoluene															
Diethylphthalate															
4-chlorophenyl-phenylether															
Fluorene															
4-Nitroaniline															
4,6-Dinitro-2-methylphenol															R
N-Nitrosodiphenylamine															
4-Bromophenyl-phenylether															
Hexachlorobenzene															
Pentachlorophenol															R
Phenanthrene															
Anthracene															
Di-n-butylphthalate															
Fluoranthene															
Pyrene															
Butylbenzylphthalate															
3,3'-Dichlorobenzidine															
Benz(a)anthracene															
Chrysene															
bis(2-ethylhexyl)phthalate					15										
Di-n-octyl phthalate															
Benzo(b)flouranthene															
Benzo(k)flouranthene															
Benzo(a)pyrene															
Indeno(1,2,3-cd)pyrene															
Dibenz(a,h)anthracene															
Benzo(g,h,i)perylene															

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters - Semi-Volatiles	GW-11SDDRE	GW-12D	GW-13D	GW-13DRE	GW-13S	SBLKW1	SBLKW2	SBLKW3	SBLKW4	SBLKW5	DW-2MS	DW-2MSD
Phenol	R		R	R							58	48
bis (2-chloroethyl) ether	UJ											
2-Chlorophenol	R		R	R							110	96
1,3-Dichlorobenzene	UJ											
1,4-Dichlorobenzene	UJ										41	52
Benzyl Alcohol	UJ											
1,2-Dichlorobenzene	UJ											
2-Methylphenol	R		R	R								
2,2-oxybis(1-chloropriopane)	UJ											
4-methylphenol	R		R	R								
N-Nitroso-di-n-propylamine	UJ										44	60
Hexachloroethane	UJ											
Nitrobenzene	UJ											
Isophorone	UJ											
2-Nitrophenol	R		R	R								
2,4-Dimethylphenol	R		R	R								
Benzoic Acid	UJ											
bis(2-chloroethoxy)methane	UJ											
2,4-Dichlorophenol	R		R	R								
1,2,4-Trichlorobenzene	UJ										39	50
Naphthalene	UJ											
4-chloroaniline	UJ											
Hexachlorobutadiene	UJ											
4-chloro-3-methylphenol	R		R	R							110	100
2-methylnaphthalene	UJ											
Hexachlorocyclopentadiene	UJ											
2,4,6-Trichlorophenol	R		R	R								
2,4,5-Trichlorophenol	R		R	R								
2-Chloronaphthalene	UJ											
2-Nitroaniline	UJ											
Dimethylphthalate	UJ											
Acenaphthyl[illegible]e	UJ											

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WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/WATER - DATA SUMMARY (cont.)

CASE NO. 9102.587

All results reported in ug/L

Parameters - Semi-Volatiles	GW-11SDDRE	GW-12D	GW-13D	GW-13DRE	GW-13S	SBLKW1	SBLKW2	SBLKW3	SBLKW4	SBLKW5	DW-2MS	DW-2MSD
2,6-Dinitrotoluene	UJ											
3-Nitroaniline	UJ											
Acenaphthene	UJ										49	56
2,4-Dinitrophenol	R		R	R								
4-Nitrophenol	R		R	R							44 J	32 J
Dibenzofuran	UJ											
2,4-Dinitrotoluene	UJ										59	66
Diethylphthalate	UJ											
4-chlorophenyl-phenylether	UJ											
Fluorene	UJ											
4-Nitroaniline	UJ											
4,6-Dinitro-2-methylphenol	R		R	R								
N-Nitrosodiphenylamine	UJ											
4-Bromophenyl-phenylether	UJ											
Hexachlorobenzene	UJ											
Pentachlorophenol	R		R	R							38 J	40 J
Phenanthrene	UJ											
Anthracene	UJ											
Di-n-butylphthalate	UJ											
Fluoranthene	UJ											
Pyrene	UJ										53	60
Butylbenzylphthalate	UJ											
3,3'-Dichlorobenzidine	UJ											
Benz(a)anthracene	UJ											
Chrysene	UJ											
bis(2-ethylhexyl)phthalate	UJ											
Di-n-octyl phthalate	UJ											UJ
Benzo(b)flouranthene	UJ											UJ
Benzo(k)flouranthene	UJ											UJ
Benzo(a)pyrene	UJ											UJ
Indeno(1,2,3-cd)pyrene	UJ											UJ
Dibenz(a,h)anthracene	UJ											UJ
Benzo(g,h,i)perylene	UJ											UJ

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9103.051 **All results reported in ug/kg**

Parameters - SemiVolatiles	TP-1	TP-2	TP-3	TP-4	TP-5	SBLKS1	MSB	TP-5MS	TP-5MSD
Phenol							3700	8600	8200 J
bis (2-chloroethyl) ether									UJ
2-Chlorophenol							3300	7900	7500 J
1,3-Dichlorobenzene									UJ
1,4-Dichlorobenzene							1800	3300	3400 J
Benzyl Alcohol				1200 J					UJ
1,2-Dichlorobenzene				1200 J	670 J				UJ
2-Methylphenol									UJ
2,2-oxybis(1-chloropriopane)									UJ
4-methylphenol	1600 J	820 J	870		370 J			200 J	UJ
N-Nitroso-di-n-propylamine							2000	3600	3500 J
Hexachloroethane									UJ
Nitrobenzene									
Isophorone									
2-Nitrophenol									
2,4-Dimethylphenol									
Benzoic Acid									
bis(2-chloroethoxy)methane									
2,4-Dichlorophenol									
1,2,4-Trichlorobenzene							1900	2500	2300
Naphthalene		140 J			150 J			73 J	
4-chloroaniline									
Hexachlorobutadiene									
4-chloro-3-methylphenol		300 J					4100	5700	6500
2-methylnaphthalene		180 J			190 J			58 J	2100 J
Hexachlorocyclopentadiene					UJ				UJ
2,4,6-Trichlorophenol					UJ				UJ
2,4,5-Trichlorophenol					UJ				UJ
2-Chloronaphthalene					UJ				UJ
2-Nitroaniline					UJ				UJ
Dimethylphthalate				910 J	530 J				200 J
Acenaphthylene					UJ				UJ

WELLSVILLE/ANDOVER LANDFILL SITE

SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9103.051

All results reported in ug/kg

Parameters - SemiVolatiles	TP-1	TP-2	TP-3	TP-4	TP-5	SBLKS1	MSB	TP-5MS	TP-5MSD
2,6-Dinitrotoluene					UJ				UJ
3-Nitroaniline					UJ				UJ
Acenaphthene					UJ		2400	3600	3500 J
2,4-Dinitrophenol					UJ				UJ
4-Nitrophenol					UJ		6400	8100 J	12000 J
Dibenzofuran					UJ				UJ
2,4-Dinitrotoluene					UJ		2900	2600	3100 J
Diethylphthalate	110 J		25 J		UJ				UJ
4-chlorophenyl-phenylether					UJ				UJ
Fluorene					UJ				UJ
4-Nitroaniline					UJ				UJ
4,6-Dinitro-2-methylphenol					UJ			UJ	UJ
N-Nitrosodiphenylamine					UJ			UJ	UJ
4-Bromophenyl-phenylether					UJ			UJ	UJ
Hexachlorobenzene					UJ			UJ	UJ
Pentachlorophenol					6600 J		4100	5500 J	7900 J
Phenanthrene	130 J	540 J			610 J			190 J	140 J
Anthracene					UJ			UJ	UJ
Di-n-butylphthalate		270 J	49 U	14000	4100 J		21 J	690 J	4500 J
Fluoranthene	280 J	720 J			300 J			UJ	160 J
Pyrene	190 J	530 J			340 J		3200	3800 J	3300 J
Butylbenzylphthalate		16000		1000 J	2700 J			UJ	UJ
3,3'-Dichlorobenzidine					UJ			UJ	UJ
Benz(a)anthracene					UJ			UJ	UJ
Chrysene		410 J			UJ			UJ	UJ
bis(2-ethylhexyl)phthalate	1100 J	1100 J	130 U	8300	8300 J		83 J	1500 J	2200 J
Di-n-octyl phthalate					UJ			UJ	UJ
Benzo(b)flouranthene		370 J			UJ			UJ	UJ
Benzo(k)flouranthene					UJ			UJ	UJ
Benzo(a)pyrene		280 J			UJ			UJ	UJ
Indeno(1,2,3-cd)pyrene					UJ			UJ	UJ
Dibenz(a,h)anthracene					UJ			UJ	UJ
Benzo(g,h,i)perylene					UJ			UJ	UJ

DATA SUMMARY TABLES

PESTICIDES AND PCB'S

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/SOIL - DATA SUMMARY

CASE NO. 9102.123 **All results reported in ug/kg**

Parameters-Pesticides/PCB's	SB-1A	SB-1B	SB-6A	SB-6B	PBLKS3	PBLKS1	SB-6AMS	SB-6AMSD	MSB2	MSB1
alpha-BHC			UJ	UJ			UJ	UJ		
beta-BHC			UJ	UJ			UJ	UJ		
delta-BHC			UJ	UJ			UJ	UJ		
gamma-BHC(Lindane)			UJ	UJ			21 J	27 J	29	28
Heptachlor			UJ	UJ			27 J	31 J	29	30
Aldrin			UJ	UJ			21 J	27 J	31	38
Heptachlor Epoxide			UJ	UJ			UJ	UJ		
Endosulfan I			UJ	UJ			UJ	UJ		
Dieldrin			UJ	UJ			57 J	74 J	63	75
4,4'-DDE			UJ	UJ			UJ	UJ		
Endrin			UJ	UJ			58 J	79 J	75	79
Endosulfan II			UJ	UJ			UJ	UJ		
4,4'-DDD			UJ	UJ			UJ	UJ		
Endosulfan Sulfate			UJ	UJ			UJ	UJ		
4,4'-DDT			UJ	UJ			69 J	87 J	69	98
Methoxychlor			UJ	UJ			UJ	UJ		
Endrin Ketone			UJ	UJ			UJ	UJ		
alpha-chlordane			UJ	UJ			UJ	UJ		
gamma-chlordane			UJ	UJ			UJ	UJ		
Toxaphene			UJ	UJ			UJ	UJ		
Aroclor-1016			UJ	UJ			UJ	UJ		
Aroclor-1221			UJ	UJ			UJ	UJ		
Aroclor-1232			UJ	UJ			UJ	UJ		
Aroclor-1242			UJ	UJ			UJ	UJ		
Aroclor-1248			UJ	UJ			UJ	UJ		
Aroclor-1254			UJ	UJ			UJ	UJ		
Aroclor-1260			UJ	UJ			UJ	UJ		

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/WATER
DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/L**

Parameters-Pesticides/PCB's	DW-1	R-1	PBLKW1
alpha-BHC			
beta-BHC			
delta-BHC			
gamma-BHC(Lindane)			
Heptachlor			
Aldrin			
Heptachlor Epoxide			
Endosulfan I			
Dieldrin			
4,4'-DDE			
Endrin			
Endosulfan II			
4,4'-DDD			
Endosulfan Sulfate			
4,4'-DDT			
Methoxychlor			
Endrin Ketone			
alpha-chlordane			
gamma-chlordane			
Toxaphene			
Aroclor-1016			
Aroclor-1221			
Aroclor-1232			
Aroclor-1242			
Aroclor-1248			
Aroclor-1254			
Aroclor-1260			

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/SOIL - DATA SUMMARY

CASE NO. 9102.282 **results reported in ug/kg**

Parameters-Pesticides/PCB's	SB-8A	SB-8AD	SB-8B	PBLKS2	SB-8BMS	MSB3
alpha-BHC						
beta-BHC						
delta-BHC						
gamma-BHC(Lindane)					30	24
Heptachlor					42	26
Aldrin					29	25
Heptachlor Epoxide						
Endosulfan I						
Dieldrin					74	65
4,4'-DDE						
Endrin					80	71
Endosulfan II						
4,4'-DDD						
Endosulfan Sulfate						
4,4'-DDT					81	74
Methoxychlor						
Endrin Ketone						
alpha-chlordane						
gamma-chlordane						
Toxaphene						
Aroclor-1016						
Aroclor-1221						
Aroclor-1232						
Aroclor-1242						
Aroclor-1248						
Aroclor-1254						
Aroclor-1260						

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/SOIL - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/kg

Parameters-Pesticides/PCB's	SB-7A	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-6	PBLKS1	PBLKS2	SED-4MS	SED-4MSD	MSB2
alpha-BHC														
beta-BHC														
delta-BHC														
gamma-BHC(Lindane)												45	49	22 J
Heptachlor												77	67	24 J
Aldrin												44	49	22 J
Heptachlor Epoxide														
Endosulfan I														
Dieldrin												110	120	56 J
4,4'-DDE														
Endrin												120	130	60 J
Endosulfan II														
4,4'-DDD														
Endosulfan Sulfate														
4,4'-DDT												110	130	62 J
Methoxychlor														
Endrin Ketone														
alpha-chlordane														
gamma-chlordane														
Toxaphene														
Aroclor-1016														
Aroclor-1221														
Aroclor-1232														
Aroclor-1242														
Aroclor-1248														
Aroclor-1254														
Aroclor-1260														

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/WATER - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/L

Parameters-Pesticides/PCB's	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	PBLKW1	SW-4MS	SW-4MSD	MSB1
alpha-BHC											
beta-BHC											
delta-BHC											
gamma-BHC(Lindane)									0.18	0.18	0.18
Heptachlor									0.15	0.15	0.14
Aldrin									0.15	0.14	0.14
Heptachlor Epoxide											
Endosulfan I											
Dieldrin									0.50	0.49	0.50
4,4'-DDE											
Endrin									0.53	0.53	0.53
Endosulfan II											
4,4'-DDD											
Endosulfan Sulfate											
4,4'-DDT									0.52	0.53	0.52
Methoxychlor											
Endrin Ketone											
alpha-chlordane											
gamma-chlordane											
Toxaphene											
Aroclor-1016											
Aroclor-1221											
Aroclor-1232											
Aroclor-1242											
Aroclor-1248											
Aroclor-1254											
Aroclor-1260											

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/SOIL - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/kg

Parameters-Pesticides/PCB's	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-10D	SS-11	SS-12	SS-13	SS-14	SS-1
alpha-BHC															
beta-BHC															
delta-BHC															
gamma-BHC(Lindane)															
Heptachlor															
Aldrin															
Heptachlor Epoxide															
Endosulfan I															
Dieldrin															
4,4'-DDE															
Endrin															
Endosulfan II															
4,4'-DDD															
Endosulfan Sulfate															
4,4'-DDT															
Methoxychlor															
Endrin Ketone															
alpha-chlordane															
gamma-chlordane															
Toxaphene															
Aroclor-1016															
Aroclor-1221															
Aroclor-1232															
Aroclor-1242															
Aroclor-1248															
Aroclor-1254															
Aroclor-1260															

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Parameters-Pesticides/PCB's	PBLKS1	PBLKS2	SS-11MS	SS-11MSD	MSB2
alpha-BHC					
beta-BHC					
delta-BHC					
gamma-BHC(Lindane)			52	59	28
Heptachlor			74	82	29
Aldrin			55	55	27
Heptachlor Epoxide					
Endosulfan I					
Dieldrin			130	160	71
4,4'-DDE					
Endrin			87	170	79
Endosulfan II					
4,4'-DDD					
Endosulfan Sulfate					
4,4'-DDT			87	170	82
Methoxychlor					
Endrin Ketone					
alpha-chlordane					
gamma-chlordane					
Toxaphene					
Aroclor-1016					
Aroclor-1221					
Aroclor-1232					
Aroclor-1242					
Aroclor-1248					
Aroclor-1254					
Aroclor-1260					

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/WATER - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/L

	L-1	L-2				
Parameters-Pesticides/PCB's	MH-4	PS-2	PBLKW1	PS-2MS	PS-2MSD	MSB1
alpha-BHC						
beta-BHC						
delta-BHC						
gamma-BHC(Lindane)				1.4	1.4	1.5
Heptachlor				1.8	1.8	1.6
Aldrin				1.7	1.7	1.4
Heptachlor Epoxide						
Endosulfan I						
Dieldrin				4.5	4.5	4.6
4,4'-DDE						
Endrin				5.3	5.2	5.3
Endosulfan II						
4,4'-DDD						
Endosulfan Sulfate						
4,4'-DDT				6.2	6.1	6.3
Methoxychlor						
Endrin Ketone						
alpha-chlordane						
gamma-chlordane						
Toxaphene						
Aroclor-1016						
Aroclor-1221						
Aroclor-1232						
Aroclor-1242						
Aroclor-1248						
Aroclor-1254						
Aroclor-1260						

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WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/WATER - DATA SUMMARY

CASE NO. 9102.556

All results reported in ug/L

Parameters-Pesticides/PCB's	GW-1D	GW-2D	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-10D	GW-10S	PBLKW1	MSB1	GW-10DMS	GW-10DMSD
alpha-BHC													
beta-BHC													
delta-BHC													
gamma-BHC(Lindane)											0.16	0.15	0.17
Heptachlor											0.098	0.098	0.13
Aldrin											0.078	0.084	0.12
Heptachlor Epoxide													
Endosulfan I													
Dieldrin											0.47	0.40	0.49
4,4'-DDE													
Endrin											0.50	0.43	0.52
Endosulfan II													
4,4'-DDD													
Endosulfan Sulfate													
4,4'-DDT											0.57	0.51	0.57
Methoxychlor													
Endrin Ketone													
alpha-chlordane													
gamma-chlordane													
Toxaphene													
Aroclor-1016													
Aroclor-1221													
Aroclor-1232													
Aroclor-1242													
Aroclor-1248													
Aroclor-1254													
Aroclor-1260													

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WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters-Pesticides/PCB's	GW-5D	GW-5S	GW-6D	GW-6S	GW-7D	GW-11S	GW-11SDD	GW-12D	GW-13D	GW-13S	DW-1	DW-2	DW-3
alpha-BHC													
beta-BHC													
delta-BHC													
gamma-BHC(Lindane)													
Heptachlor													
Aldrin													
Heptachlor Epoxide													
Endosulfan I													
Dieldrin													
4,4'-DDE													
Endrin													
Endosulfan II													
4,4'-DDD													
Endosulfan Sulfate													
4,4'-DDT													
Methoxychlor													
Endrin Ketone													
alpha-chlordane													
gamma-chlordane													
Toxaphene													
Aroclor-1016													
Aroclor-1221													
Aroclor-1232													
Aroclor-1242													
Aroclor-1248													
Aroclor-1254													
Aroclor-1260													

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Parameters-Pesticides/PCB's	DW-4	DW-5	DW-5D	DW-6	DW-7	PBLKW2	DW-2MS	DW-2MSD	MSB2
alpha-BHC									
beta-BHC									
delta-BHC									
gamma-BHC(Lindane)							0.20	0.18	0.19
Heptachlor							0.15	0.16	0.13
Aldrin							0.12	0.15	0.12
Heptachlor Epoxide									
Endosulfan I									
Dieldrin							0.54	0.50	0.49
4,4'-DDE									
Endrin							0.58	0.54	0.52
Endosulfan II									
4,4'-DDD									
Endosulfan Sulfate									
4,4'-DDT							0.65	0.63	0.57
Methoxychlor									
Endrin Ketone									
alpha-chlordane									
gamma-chlordane									
Toxaphene									
Aroclor-1016									
Aroclor-1221									
Aroclor-1232									
Aroclor-1242									
Aroclor-1248									
Aroclor-1254									
Aroclor-1260									

WELLSVILLE/ANDOVER LANDFILL SITE

PESTICIDES and PCB'S/SOIL - DATA SUMMARY

CASE NO. 9103.051

All results reported in ug/kg

Parameters-Pesticides/PCB's	TP-1	TP-2	TP-3	TP-4	TP-5	PBLKS1	PBLKS2	TP-4MS	TP-4MSD	MSB1
alpha-BHC										
beta-BHC	12 J									
delta-BHC										
gamma-BHC(Lindane)										21
Heptachlor										28
Aldrin										30
Heptachlor Epoxide										
Endosulfan I										
Dieldrin		13 J								64
4,4'-DDE		15 J								
Endrin										65
Endosulfan II										
4,4'-DDD		43 J			120					
Endosulfan Sulfate										
4,4'-DDT		130 J								67
Methoxychlor										
Endrin Ketone										
alpha-chlordane										
gamma-chlordane										
Toxaphene										
Aroclor-1016										
Aroclor-1221										
Aroclor-1232										
Aroclor-1242										
Aroclor-1248										
Aroclor-1254										
Aroclor-1260										

DATA SUMMARY TABLES

INORGANICS

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WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/SOIL - DATA SUMMARY

CASE NO. 9102.123

All results reported in mg/kg

Parameters - Inorganics	SB-1A	SB-1B	SB-10A	SB-2A	SB-3A	SB-3B	SB-4A	SB-4B	SB-5B	SB-5C	SB-6A	SB-6B
Aluminum	18100	16200	13400	15600	15500	12800	13600	14500	13800	11100	13500	13100
Antimony	R	R	R	R	R	R	R	R	R	R	R	R
Arsenic	2.9 J	6.84 J	14.1 J	12.7 J	16.4 J	7.1 J	1.3 J	12.7 J	8.97 J	5.0 J	10.6 J	15.7 J
Barium	31.2 B	72.3	182	109	71.3	137	281	42.8 B	132	80.7	64.9	67.2
Beryllium	0.64 B	0.50 B	0.67 B	1.1 B	0.69 B	0.59 B	0.63 B	0.86 B	0.77 B	0.49 B	0.58 B	0.65 B
Cadmium			1.8	1.3								
Calcium	1180	1050 B	1150	850 B	360 B	1150	1640	1440	1230	1370	742 B	777 B
Chromium	27.6	21.1	18.6	20.8	18.6	18.2	22.2	21.1	20.1	15.4	18.7	17.5
Cobalt	33.2	25.8	27.0	30.2	29.2	22.5	30.1	32.7	25.6	21.3	26.5	21.7
Copper	37.0	7.7	15.1	29.3	9.8	12.8	21.1	18.3	15.7	26.3	15.5	12.5
Iron	43700	32900	32100	45200	35100	30600	32500	41400	33700	26000	36700	32800
Lead	6.6	18.4	45.3	11.6	32.8	20.1		8.01 J	13.0	12.7	27.7	35.6
Magnesium	6680	3650	4250	6710	3590	4570	5820	6020	5030	4260	4660	4720
Manganese	431 J	1750	1430	686	1140	668	1670	1010	694	551	1040	461
Mercury												
Nickel	53.4	25.8	31.7	42.1	25.7	30.4	41.9	48.0	36.4	30.1	38.5	31.5
Potassium	1870	1520	1340	2430	1510	1840	1780	1990	1710	1110 B	1520	1720
Selenium	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Silver	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Sodium	54.6 B	34.2 B	38.3 B	99.5 B	35.5 B	71.7 B					54.3 B	67.0 B
Thallium												
Vanadium	21.9	24.8	19.1	19.0	21.4	16.9	18.9	20.6	18.7	15.8	15.9	14.8
Zinc	96.5 J	75.2 J	64.8 J	87.3 J	56.9 J	65.7 J	74.6 J	78.0 J	72.1 J	64.6 J	71.6 J	66.7 J
Cyanide												

WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/SOIL - DATA SUMMARY

CASE NO. 9102.282 **All results reported in mg/kg**

Parameters - Inorganics	SB-10B	SB-8A	SB-8AD	SB-8B	SB-9A	SB-9B
Aluminum	5550	12100	13200	11500	13800	13900
Antimony						
Arsenic	3.1	14.1	10.4	10.6	17.4	17.9
Barium	40.5 B	111	111	90.2	122	87.7
Beryllium		0.51 B	0.61 B	0.59 B	0.65 B	0.92 B
Cadmium			1.4 U	1.6 U		0.80 U
Calcium	77500	1180	1320	1540	1700	1800
Chromium	9.3	15.1	18.8	14.8	18.9	15.1
Cobalt	14.5	21.8	24.9	23.2	25.4	30.1
Copper	9.5	17.3	16.9	12.6	17.9	22.9
Iron	14700	29400	32700	33900	33300	35100
Lead	7.3	13.9	12.3	11.8	22.4	8.0
Magnesium	17100	4130	4890	4900	5450	5200
Manganese	290	996	828	1420	771	894
Mercury				0.12		
Nickel	16.9	32.2	34.7	31.1	35.6	37.9
Potassium	630 B	1470	1790	1560	1840	2100
Selenium						
Silver						
Sodium	103 B	52.4 B	56.6 B	61.6 B	64.2 B	80.1 B
Thallium						
Vanadium	11.0 B	14.0	16.2	14.2	16.1	16.6
Zinc	56.3	60.1	66.2	62.1	69.3	75.2
Cyanide						

WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/WATER - DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/L**

Parameters - Inorganics	DW-1	R-1
Aluminum	142 B	13.6 B
Antimony		
Arsenic		
Barium	67.5 B	
Beryllium		
Cadmium		6.5
Calcium	19500	
Chromium		
Cobalt		
Copper		
Iron	245	23.6 B
Lead		1.5 B
Magnesium	5330	
Manganese	9.5 U	
Mercury		
Nickel		
Potassium	2200 B	
Selenium		
Silver	8.0 B	12.7
Sodium	9920	
Thallium		
Vanadium		
Zinc	7.7 U	
Cyanide		

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WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/SOIL - DATA SUMMARY

CASE NO. 9102.387 **All results reported in mg/kg**

Parameters - Inorganics	SB-7A	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-6
Aluminum	13000	12500	12800	13000	12400	14500	16900	11200	11000
Antimony	R	R	R	R	R	R	R	R	R
Arsenic	11.7	14.5	12.7	10.9	11.0	9.6	14.3	8.1	13.5
Barium	129	43.0	123	97.4	175	169	202	192	129
Beryllium	0.80 B	0.94 B	0.81 B	0.96 B	0.89 B	0.91 B	1.1 B	0.85 B	0.85 B
Cadmium									
Calcium	1600	1420	2010	1320 B	1290	1470 B	1760 B	1150 B	999 B
Chromium	22.0	21.7	22.5	21.3	18.5	20.9	24.4	18.5	18.3
Cobalt	27.7	27.0	26.9	27.8	26.1	24.8	29.7	27.9	25.4
Copper	23.6	16.7	20.5	16.0	16.0	19.8	23.0	16.7	15.7
Iron	33500	35800	32400	43200	36000	31600	38400	39000	40200
Lead	20.3 J	13.3 J	26.1 J	20.8 J	20.7 J	20.2 J	26.7 J	3.2 J	18.9 J
Magnesium	5130	4600	3900	3630	3720	4270	5010	3660	3510
Manganese	849	909	1180	2440	1200	705	891	1480	808
Mercury									
Nickel	39.0	40.1	40.1	33.4	37.7	36.2	42.2	38.1	36.0
Potassium	1680	2710	1200 B	1310 B	1230 B	1790 B	2140	1110 B	1060 B
Selenium	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Silver	R	R	R	R	R	R	R	R	R
Sodium	44.4 B	54.1 B		108 B					
Thallium									
Vanadium	19.0	21.0	22.8	22.1	19.7	21.4	25.3	17.5	18.2
Zinc	72.0	71.3	84.7	96.3	107	81.0	96.9	78.7	76.1
Cyanide									

WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/WATER - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/L

Parameters - Inorganics	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6
Aluminum	578	307	496	119 B	274	874	96.0 B
Antimony							
Arsenic							
Barium	35.4 B	43.6 B	99.3 B	49.5 B	50.8 B	57.7 B	49.2 B
Beryllium							
Cadmium							
Calcium	15400	15900	19800	18000	17900	18300	17200
Chromium							
Cobalt	6.1 U	8.9 U	5.6 U	5.2 U	6.0 U	6.5 U	7.0 U
Copper		5.8 B					
Iron	1110 J	3840 J	778 J	150 J	387 J	1610 J	130 J
Lead	2.2 J	1.7 J	4.8 J	4.9 J	2.5 J	2.7 J	1.1 J
Magnesium	4490 B	7200	7010	6600	6600	6800	6360
Manganese	533	3090	143	6.2 U	9.2 U	68.5	9.9 U
Mercury							
Nickel		30.6 B					
Potassium	2980 B	1770 B	1480 B	1430 B	1490 B	1790 B	1250 B
Selenium	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Silver							
Sodium	4170 B	22100	8980	14800	14700	15000	13800
Thallium							
Vanadium	6.5 B	6.3 B	6.1 B		5.5 B	5.8 B	7.3 B
Zinc	8.5 B	19.4 B	10.7 B	4.1 B	7.3 B	6.8 B	
Cyanide							

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WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/SOIL - DATA SUMMARY

CASE NO. 9102.414 **All results reported in mg/kg**

Parameters - Inorganics	SS-1	SS-10	SS-10D	SS-11	SS-12	SS-13	SS-14	SS-2	SS-3	SS-4
Aluminum	13100	10600	11000	7340	13100	11500	10500	10400	1030	12300
Antimony	R	R	R	R	R	R	R	R	R	R
Arsenic	10.3	9.6	9.7	6.4	12.3	13.4	4.0	13.5	7.3	10.0
Barium	97.3 J	151 J	147 J	309 J	87.4 J	107 J	90.8 J	90.8 J	741 J	43.9 J
Beryllium	0.61 B	0.60 B	0.56 B		0.70 B	0.71 B	0.56 B	0.47 B		0.49 B
Cadmium										
Calcium	3390	4550	3120	5460	1680	3110	650 B	915 B	173000	176 B
Chromium	17.3	19.8	20.0	40.4	18.8	20.3	17.0	12.9	23.3	19.6
Cobalt	22.4	31.6	30.1	87.3	26.3	31.6	22.8	17.7	53.0	20.9
Copper	11.3	18.0	18.0	14.7	12.8	17.3	11.7	6.6	1.5 B	18.4
Iron	27400 J	60300 J	54300 J	283000 J	29800 J	46400 J	23800 J	24900 J	182000 J	30300 J
Lead	17.5	15.8	22.4	56.1	17.9	23.0	16.4	17.3	35.5	15.1
Magnesium	2440	4320	3720	2790	3120	3700	2920	1710	2950	3840
Manganese	1260 J	922 J	880 J	798 J	1190 J	1940 J	235 J	1170 J	4540 J	418 J
Mercury	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Nickel	21.0	34.3	33.0	88.0	25.3	32.6	24.2	15.8	40.0	28.8
Potassium	1130 B	1570	1750	2250	1670	1670	1510	853 B	1230 B	1300
Selenium	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ
Silver	R	R	R	R	R	R	R	R	R	R
Sodium	90.9 B	76.3 B	71.0 B			94.8 B		74.8 B	1610 B	49.1 B
Thallium										
Vanadium	22.3	18.9	19.9	21.0 B	25.6	22.7	20.7	21.7	12.6 B	19.0
Zinc	58.2	98.1	95.2	193	59.3	131	72.3	43.0	356	51.4
Cyanide				3.5 J						

WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/SOIL - DATA SUMMARY
(continued)

CASE NO. 9102.414 **All results reported in mg/kg**

Parameters - Inorganics	SS-5	SS-6	SS-7	SS-8	SS-9
Aluminum	10300	14300	14300	11100	9740
Antimony	R	R	R	R	R
Arsenic	11.9	12.6	10.5	11.8	11.8
Barium	99.8 J	96.5 J	135 J	105 J	84.8 J
Beryllium	0.52 B	0.70 B	0.71 B	0.57 B	0.49 B
Cadmium					
Calcium	1070 B	925 B	1200 B	2360	31300
Chromium	16.3	23.6	24.0	19.3	15.9
Cobalt	23.4	29.1	27.5	27.1	21.1
Copper	17.8	28.2	26.5	19.6	19.1
Iron	26700 J	42500 J	40200 J	45600 J	26300 J
Lead	15.1	13.2	23.8	14.5	15.6
Magnesium	3860	5290	5040	3510	9060
Manganese	987 J	446 J	374 J	548 J	1000 J
Mercury	UJ	UJ	UJ	UJ	UJ
Nickel	33.6	43.3	39.4	32.2	26.9
Potassium	1240 B	1950	1930	1870	1400
Selenium	UJ	UJ	UJ	UJ	UJ
Silver	R	R	R	R	R
Sodium	40.1 B	78.8 B	85.9 B	134 B	95.3 B
Thallium					
Vanadium	14.4	19.4	21.7	19.4	17.7
Zinc	92.0	74.5	77.4	61.6	102
Cyanide					

WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/WATER – DATA SUMMARY

CASE NO. 9102.414 **All results reported in ug/L**

	L-1	L-2
Parameters – Inorganics	MH-4	PS*2
Aluminum	27600 J	774 J
Antimony	UJ	UJ
Arsenic	12.5 J	R
Barium	406	577
Beryllium	0.96 B	
Cadmium		
Calcium	191000	123000
Chromium	39.9	15.2
Cobalt	58.4	55.4
Copper	35.2	8.0 B
Iron	71900	165000
Lead	47.9 J	27.2 J
Magnesium	42800	50300
Manganese	3670	1880
Mercury		
Nickel	54.5	38.8 B
Potassium	50700	33400
Selenium	R	R
Silver	UJ	UJ
Sodium	33600	71500
Thallium		
Vanadium	52.2	11.6 B
Zinc	151 E	227 J
Cyanide		

WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/WATER - DATA SUMMARY

CASE NO. 9102.556

All results reported in ug/L

Parameters - Inorganics	GW-1D	GW-2D	GW-2S	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-9S	GW-10D	GW-10S
Aluminum	364	742	42700	252	3040	393	217	3650	342	1250	1760
Antimony											
Arsenic	2.9 B	9.1 B	17.8		2.4 B			4.3 B		5.6B	4.1B
Barium	273	49.0 B	342	101 B	53.4 B	13.9 B	61.4 B	43.4 B	36.8 B	262	208
Beryllium			2.2 B								
Cadmium											
Calcium	21800	30600	53600	49700	31900	13100	85200	26400	67900	25300	15700
Chromium	11.6		110								
Cobalt		8.1 B	102		14.7 B		11.5 B	13.4 B	9.0 B	9.5B	10.5B
Copper		3.3 B	115		7.7 B			9.7 B		8.0B	
Iron	972 J	1910 J	110000 J	524 J	6270 J	634 J	542 J	8290 J	1630 J	3270J	4620J
Lead		4.1 J	38.1 J		6.0 J		11.0 J	5.7 J	1.2 J	7.6J	3.3J
Magnesium	8600	15600	50500	21400	19100	12100	56000	13100	30600	8090	6300
Manganese	227	1820	8530	41.2	1300	72.3	2200	179	1490	387	4110
Mercury											
Nickel			155								
Potassium	2090 B	14900	17500	18800	5960	1990 B	4940 B	18300	11300	27100	4380B
Selenium											
Silver											
Sodium	4690 B	19700	20900	29800	20400	9730	35500	32600	33200	20200	5720
Thallium											
Vanadium		7.3 B	67.1	6.4 B	10.2 B	7.0 B	8.7 B	12.7 B	7.2 B	8.4B	7.8B
Zinc		16.0 B	230		24.1		7.1 B	62.4	5.7 B	27.2	11.0B
Cyanide											

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WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/WATER - DATA SUMMARY

CASE NO. 9102.587 **All results reported in ug/L**

Parameters - Inorganics	DW-1	DW-2	DW-3	DW-4	DW-5	DW-5D	DW-6	DW-7	GW-12S	GW-11S
Aluminum	107 B	25.6 B	741	200 B	645	134 B	400	16.9 B	2760 J	2230 J
Antimony										
Arsenic									3.1 B	
Barium	32.8 B	72.8 B	67.0 B	54.7 B	26.4 B	24.3 B	31.5 B	34.7 B	91.9 B	69.5 B
Beryllium										
Cadmium										
Calcium	40100	37400	21300	33300	44900	44800	13400	21800	31000	43800
Chromium			11.1						22.2	
Cobalt										
Copper	4.5 B		29.8	3.6 B	7.3 B			33.8	9.0 B	3.7 B
Iron	534	48.3 U	693	730	535	193	1300	107	5780	4260
Lead		1.8 B							125	3.5
Magnesium	13300	13400	6070	12100	19600	19600	8160	8230	3100 B	22100
Manganese	510	148	17.7	150	54.6	41.1	166	76.9	123	2030
Mercury				0.46						
Nickel										
Potassium	1450 B	1240 B	1150 B	1400 B	1810 B	1680 B	1100 B	1450 B	38000	2140 B
Selenium										
Silver										
Sodium	50400	8200	31600	58000	17000	8540	4110 B	55100	41700	14600
Thallium										
Vanadium									27.9 B	
Zinc	8.8 B	134	39.4	338	26.7	7.9 B	9.7 B	5.3 B	83.4	26.4
Cyanide							19.0			

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WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Parameters - Inorganics	GW-11SDD	GW-12D	GW-13D	GW-13S	GW-5D	GW-5S	GW-6D	GW-6S	GW-7D
Aluminum	2480 J	910 J	2640 J	286	3140 J	531	131 B	8990 J	29.5 B
Antimony									
Arsenic			3.5 B		3.5 B	2.5 B		6.4 B	
Barium	71.3 B	36.4 B	211	85.7 B	110 B	12.8 B	20.0 B	40.2 B	10.2 B
Beryllium									
Cadmium									
Calcium	44000	71300	47500	54600	9160	16300	16000	12800	30200
Chromium	10.0	11.0			49.6			14.2	
Cobalt								11.3 B	
Copper	9.1 B	11.6 B	4.7 B		46.2	3.2 B		15.3 B	
Iron	4440	736	5130	414	2480	650	316	15700	49.9 U
Lead	4.6		3.6		2.4 B			10.8	
Magnesium	22200	37300	21500	24800	5400	12300	11000	12200	21700
Manganese	2040	24.6	2370	2770	1060	563	828	514	16.4
Mercury									
Nickel								22.3 B	
Potassium	1970 B	2540 B	4340 B	2320 B	8880	1750 B	1230 B	5020	2520 B
Selenium									
Silver									
Sodium	18700	33300	21200	24800	516000	9920	6080	7450	19000
Thallium									
Vanadium								10.1 B	
Zinc	39.8	41.0	54.6	5.6 B	154	63.5	6.7 B	64.3	12.4 B
Cyanide									

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WELLSVILLE/ANDOVER LANDFILL SITE

INORGANICS/SOIL - DATA SUMMARY

CASE NO. 9103.051 **All results reported in mg/kg**

Parameters - Inorganics	TP-1	TP-2	TP-3	TP-4	TP-5
Aluminum	13200	9450	13900	12000	14600
Antimony	R	R	R	R	R
Arsenic	20.9 J	14.3 J	12.2 J	11.5 J	12.7 J
Barium	132 J	121 J	121 J	85.7 J	215 J
Beryllium	0.74 B	0.47 B	0.71 B	0.60 B	0.64 B
Cadmium					
Calcium	4350	9890	1610	1850	2710
Chromium	28.8	18.2	23.2	24.3	26.9
Cobalt	28.1	20.8	24.9	26.0	24.5
Copper	29.0	28.4	194	25.4	34.6
Iron	36400	23900	31700	35100	38300
Lead	33.4 J	53.5 J	15.3 J	86.9 J	62.5 J
Magnesium	5070	4470	4240	4130	3330
Manganese	760	422	661	784	709
Mercury					
Nickel	43.2	25.8	33.5	35.0	31.9
Potassium	2160	1970	2230	1570	1670
Selenium	R	R	R	R	R
Silver	UJ	UJ	UJ	UJ	UJ
Sodium	509 B	289 B	323 B	71.2 B	276 B
Thallium	UJ	UJ	UJ	UJ	UJ
Vanadium	17.8	15.1	22.0	18.6	26.2
Zinc	173 J	258 J	269 J	87.4 J	263 J
Cyanide	UJ	UJ	UJ		

TENTATIVELY IDENTIFIED COMPOUNDS

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.123

All results reported in ug/kg

Reanalyzed - see case no. 9102.414

Tentatively Identified Compounds	MW-2(SB-2A)	MW-3(SB-3A)	MW-3(SB-3B)	SB-10A	SB-1A	SB-1B	SB-4A	SB-4B	SB-5B	SB-5C	SB-6A
Freon-113				78 J							170 J
Terpene Isomer				15 J							
Terpene Isomer				8.4 J							
Hexane						6.2 J					
Unknown				36 J							

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.123

All results reported in ug/kg

Tentatively Identified Compounds	SB-6ARE	SB-6B	VBLKS1	VBLKS2	VBLKS3	VBLKS4	VBLKS5	VBLKS6	SB-5CMS	SB-5CMSD	MSB
Freon-113	57 J										
Terpene Isomer											
Terpene Isomer											
Hexane											
Unknown					6.8 J						

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.282

All results reported in ug/kg

Tentatively Identified Compounds	SB-10B	SB-8A	SB-8AD	SB-8B	SB-9A	SB-9B	VBLKS1	VBLKS2	SB-9B-MS	SB-10B-MS	SB-9B-MSD	SB-10B-MSD

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/L**

Tentatively Identified Compounds	DW-1	R-1	VBLKW1	MSB
Unknown Siloxane	14 BJ	15 BJ	13 J	

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/kg

Tentatively Identified Compounds	SB-7A	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-6	VBLKS1	SED-4MSD
Freon 113	63 J	39 J	230 J	88 J	37 J	120 J	150 J	80 J	55 J		
Unknown		5.4 J									

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/L

Tentatively Identified Compounds	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	TB-1	TB-1RE	VBLKW1	VBLKW2
Hexane	15 J	14 J									

Tentatively Identified Compounds	MSB	SW-4MS	SED-4MS	SW-4MSD
Hexane				

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/L

Tentatively Identified Compounds	(MH-4) L-1	(PS-2) L-2	TB-2	VBLKW1	VBLKW2	MSB
Unknown		12 J				
Unknown		6.0 J				

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	~~MW-2~~ SB-2A	~~MW-3~~ SB-3A	~~MW-3~~ SB-3B	SS-1-RE	SS-2	SS-2-RE	SS-3	SS-4	SS-5	SS-6	SS-7
Freon 113				110 J	95 J					27 J	
Methyl Propyl Benzene Isomer											15 J
Unknown Aliphatic Hydrocarbon											14 J
Unknown Aliphatic Hydrocarbon											37 J
Unknown Terpene											14 J
Unknown Terpene											
Unknown Terpene											
Unknown Hydrocarbon											
Unknown Hydrocarbon											
Unknown Hydrocarbon											
Unknown Hydrocarbon											
Unknown											11 J
Unknown											14 J
Unknown											15 J
Unknown											13 J
Unknown											11 J
Unknown											17 J

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WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	SS-7-RE	SS-8	SS-9	SS-10	SS-10D	SS-10D-RE	SS-11	SS-12	SS-13	SS-13-RE	SS-14	VBLKS1	VBLKS2
Freon 113	52 J												
Methyl Propyl Benzene Isomer	11 J												
Unknown Aliphatic Hydrocarbon	8.7 J												
Unknown Aliphatic Hydrocarbon	24 J												
Unknown Terpene							37 J			16 J			
Unknown Terpene							14 J						
Unknown Terpene							260 J						
Unknown Hydrocarbon	10 J						44 J						
Unknown Hydrocarbon	7.7 J						20 J						
Unknown Hydrocarbon	11 J												
Unknown Hydrocarbon	37 J												
Unknown	12 J												5.8 J
Unknown	7.1 J												
Unknown													
Unknown													
Unknown													
Unknown													

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	VBLKS3	VBLKS4	VBLKS5	MSB1	SS-4MS	SS-4MSD
Freon 113						
Methyl Propyl Benzene Isomer						
Unknown Aliphatic Hydrocarbon						
Unknown Aliphatic Hydrocarbon						
Unknown Terpene						
Unknown Terpene						
Unknown Terpene						
Unknown Hydrocarbon						
Unknown Hydrocarbon						
Unknown Hydrocarbon						
Unknown Hydrocarbon						
Unknown						
Unknown						
Unknown						
Unknown						
Unknown						
Unknown						

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.556 **All results reported in ug/L**

Tentatively Identified Compounds	GW-1D	GW-2D	GW-2DDL	GW-2S	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-9S	GW-10D
Unknown				10 J							

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.556

All results reported in ug/L

Tentatively Identified Compounds	GW-10S	VBLKW1	VBLKW2	MSB	GW-10DMS	GW-10DMSD
Unknown						

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Tentatively Identified Compounds	GW-5D	GW-5DDL	GW-5S	GW-5SDL	GW-6D	GW-6DDL	GW-6S	GW-7D	GW-11S	GW-11SDL	GW-11SDD
Propyl Benzene Isomer	54 J		10 J								
Unknown						10 J					

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Tentatively Identified Compounds	GW-11SDDDL	GW-12D	GW-12DRE	GW-12S	GW-13D	GW-13S	TB-10	VBLKW1	VBLKW2	VBLKW3	MSB
Propyl Benzene Isomer											
Unknown											

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Tentatively Identified Compounds	GW-13SMS	GW-13SMSD
Propyl Benzene Isomer		
Unknown		

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9103.051

All results reported in ug/kg

Tentatively Identified Compounds	TP-1	TP-1DL	TP-2	TP-3	TP-4	MSB	VBLKM1	VBLKS1
Alkylated Benzene Isomer	33 J		20 J	1100 J				
Alkylated Benzene Isomer	76 J		27 J					
Alkylated Benzene Isomer	44 J							
Terpene Isomer	59 J	820 J	39 J	1600 J				
1,2,3,4-tetrahydro-naphthale	100 J							
Hexane		990 U					750 J	
Unknown Oxy. Hydrocarbon	49 J							
Unknown Hydrocarbon				950 J	1400 J			
Unknown Hydrocarbon				1400 J	2400 J			
Unknown Hydrocarbon				4300 J				
Unknown Hydrocarbon				1700 J				
Unknown	66 U	11000 U	37 J	9200 U	18000 U		12000 J	
Unknown		8900 U	8.5 J	1400 U	3200 U		7400 J	
Unknown			51 J	6500 U			12000 J	
Unknown			7.8 J					
Unknown			15 J					
Unknown			71 J					

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.123

All results reported in ug/kg

Tentatively Identified Compounds	SB-1A	SB-1B	SB-6B	SBLKS1	SBLKS2	SBLKS3	MSB	SB-6A-MS	SB-6A-MSD
Unknown Oxy. Hydrocarbon		120 J							
Unknown Oxy. Hydrocarbon		78 J							
Unknown Oxy. Hydrocarbon		1200 J							
Unknown Oxy. Hydrocarbon		310 J							
Unknown Oxy. Hydrocarbon		210 J							
Unknown Carboxylic Acid		250 J	140 J						
Unknown Hydrocarbon		98 J	120 J						
Unknown Hydrocarbon		880 J							
Unknown Hydrocarbon		680 J							
Unknown Hydrocarbon		210 J							
Unknown	73 J	98 J	140 J	130 J	120 J	130 J			
Unknown	110 BJ	140 BJ	180 J	66 J	120 J	100 J			
Unknown		78 J	200 J	83 J	120 J				
Unknown		250 J	240 BJ	66 J					
Unknown		120 J	220 J	66 J					
Unknown		98 J	80 J						
Unknown		330 J	320 BJ						
Unknown			160 J						
Unknown			240 J						
Unknown			220 J						
Unknown			2200 J						
Unknown			620 J						
Unknown			2000 J						
Unknown			580 J						
Unknown			1300 J						
Unknown			680 J						
Unknown			1400 J						
Unknown			840 J						

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.282

All results reported in ug/kg

Tentatively Identified Compounds	SB-8A	SB-8AD	SB-8B	SBLKS1	MSB
Unknown Carboxylic Acid	110 J		120 J		
Unknown Carboxylic Acid	570 J				
Unknown Carboxylic Acid	180 J				
Unknown Aliphatic Hydrocarbon	91 J				
Unknown Aliphatic Hydrocarbon	73 J				
Unknown Oxy. Hydrocarbon				170 J	
Unknown	110 J	92 J	97 J	83 J	
Unknown	290 J	110 BJ	77 J	66 J	
Unknown	330 J		150 BJ	100 J	
Unknown	150 BJ			100 J	
Unknown	73 J			83 J	

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.282 **All results reported in ug/L**

Tentatively Identified Compounds	DW-1	R-1	SBLKW1	DW-1-MS
Unknown			4.0 J	

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WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/kg

Tentatively Identified Compounds	SB-7B	SED-1	SED-2	SED-3	SED-4	SED-4D	SED-5	SED-5RE
Aldol Condensation Product	4100 U	9700 U	3100 U	3600 U	7200 U	6100 U	480 U	340 U
Bis Butyl Phenol Isomer	110 J	280 J	180 J	280 J	380 J	340 J	100 J	100 J
Molecular Sulfur		130 J	180 J		220 J	510 J		
Unknown Carboxylic Acid		230 BJ	210 BJ	260 BJ	250 BJ	170 BJ	80 BJ	
Unknown Carboxylic Acid		230 J	290 J					
Unknown Aliphatic Hydrocarbon		150 J	180 J	260 J	250 J	370 J		
Unknown Aliphatic Hydrocarbon		180 J	390 J		340 J	410 J		
Unknown Aliphatic Hydrocarbon		310 J	360 J		380 J			
Unknown Aliphatic Hydrocarbon		660 J	160 J					
Unknown Aliphatic Hydrocarbon		720 J						
Unknown Aliphatic Hydrocarbon		360 J						
Unknown Oxy. Hydrocarbon		260 J	160 J		250 J	300 J		
Unknown Oxy. Hydrocarbon					250 J			
Unknown Hydrocarbon		740 J	470 J	210 J	280 J	300 J		
Unknown Hydrocarbon			210 J					
Unknown Siloxane							200 J	200 J
Unknown	110 BJ	100 BJ	130 BJ	130 BJ	160 BJ	170 BJ	100 BJ	100 BJ
Unknown	420 J	410 J	100 J	150 J	250 J	580 J	140 J	120 J
Unknown	140 J	260 J	180 J	130 J	130 J	470 J	80 J	140 J
Unknown	530 J	1600 J	1600 J	360 J	130 J	910 J	120 J	
Unknown	320 J	260 J	160 J	190 J	280 J	240 J	140 J	
Unknown	260 J	640 J	540 J	1000 J	310 J	370 J		
Unknown		200 J		130 J	310 J	1900 J		
Unknown				1600 J	470 J	370 J		
Unknown				280 J	470 J	540 J		
Unknown				230 J	470 J	1600 J		
Unknown				2100 J		1200 J		
Unknown				260 J		340 J		
Unknown				2100 J				
Unknown				1900 J				
Unknown				980 J				

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.387

All results reported in ug/kg

Tentatively Identified Compounds	SED-6	SBLKS1	SED-4MS	SED-4MSD
Aldol Condensation Product	8200 U	5300 AJ		
Bis Butyl Phenol Isomer	130 J			
Molecular Sulfur	730 J			
Unknown Carboxylic Acid	280 BJ	86 J		
Unknown Carboxylic Acid	340 J			
Unknown Aliphatic Hydrocarbon	110 J			
Unknown Aliphatic Hydrocarbon	150 J			
Unknown Aliphatic Hydrocarbon	110 J			
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Oxy. Hydrocarbon				
Unknown Oxy. Hydrocarbon				
Unknown Hydrocarbon				
Unknown Hydrocarbon				
Unknown Siloxane				
Unknown	150 BJ	120 J		
Unknown	86 J			
Unknown	130 J			
Unknown	170 J			
Unknown	110 J			
Unknown	390 J			
Unknown	190 J			
Unknown	130 J			
Unknown	430 J			
Unknown	130 J			
Unknown	280 J			
Unknown				
Unknown				
Unknown				
Unknown				

DRAFT

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.387

All results reported in ug/L

Tentatively Identified Compounds	SW-1	SW-2	SW-3	SW-4	SW-4D	SW-5	SW-6	SBLKW1	SBLKW2	SBLKW3	MSB	SW-4MS	SW-4MSD
Bis Butyl Phenol Isomer	7.0 J	6.0 J	6.0 J	9.0 J			9.0 J						
Aldol Condensation Product						22 U				23 AJ			
Unknown Aliphatic Hydrocarbon	5.9 J		14 J				12 J						
Unknown Aliphatic Hydrocarbon	5.9 J												
Unknown Aliphatic Hydrocarbon	9.7 J												
Unknown Aliphatic Hydrocarbon	34 J												
Unknown Aliphatic Hydrocarbon	17 J												
Unknown Aliphatic Hydrocarbon	14 J												
Unknown Carboxylic Acid		7.0 J			5.0 J								
Unknown Carboxylic Acid		8.0 J											
Unknown Hydrocarbon						36 BJ				67 J			
Unknown	34 BJ	31 BJ	5.0 J	17 J	20 BJ	7.0 BJ	9.0 J	11 J	16 J	7.0 J			
Unknown	8.0 J	10 J	5.0 J	13 J	29 BJ	4.0 BJ	18 BJ	12 J	11 J	5.0 J			
Unknown	13 J	15 J	18 BJ	16 J	4.0 J	47 BJ	13 J	9.0 J	23 J	38 J			
Unknown	40 BJ	56 BJ	7.0 J	64 BJ	33 BJ	17 BJ	21 BJ	5.0 J	26 J	14 J			
Unknown	28 BJ	23 BJ	16 BJ	18 J	12 BJ	6.0 J	11 J	18 J	13 J	4.0 J			
Unknown	90 BJ	7.0 J	10 J	53 BJ	41 BJ	5.0 BJ	38 BJ	8.0 J	40 J	4.0 J			
Unknown	22 J	11 J	30 BJ	14 J		5.0 BJ	25 BJ	39 J	26 J	4.0 J			
Unknown	120 BJ	150 BJ	8.0 BJ	11 J		5.0 BJ	70 BJ	9.0 J		4.0 J			
Unknown	10 BJ	80 BJ	49 BJ	55 BJ			56 BJ	34 J		4.0 J			
Unknown	9.0 J	25 J	36 BJ	5.0 BJ				9.0 J					
Unknown	110 BJ	20 J		76 BJ									
Unknown	100 BJ	150 BJ		51 J									
Unknown	57 BJ	6.0 J											
Unknown		16 BJ											
Unknown		160 BJ											
Unknown		120 BJ											
Unknown		20 J											

D R A F T

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9102.414 **All results reported in ug/kg**

Tentatively Identified Compounds	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9
Aldol Condensation Product	1700 U	4200 U	740 U	2200 U	6500 U	5700 U	7000 U	4700 U	
Bis Butyl Phenol Isomer		230 U			170 U	130 U			
Molecular Sulfur							400 J		
Pharmaceutical Sulfur									
Unknown Carboxylic Acid	570 BJ	870 BJ	1400 BJ	110 BJ	250 BJ	210 BJ	250 J	770 BJ	230 BJ
Unknown Carboxylic Acid	980 J	810 J			380 J	230 J	450 BJ	700 J	
Unknown Carboxylic Acid	2800 J	2300 J						940 J	
Unknown Carboxylic Acid		370 J							
Unknown Aliphatic Hydrocarbon	740 J	540 J	1900 J		210 J	110 J	430 J	1900 J	300 J
Unknown Aliphatic Hydrocarbon	1900 J	390 J	2800 J		570 J		520 J	2100 J	980 J
Unknown Aliphatic Hydrocarbon	2000 J		2500 J		670 J		380 J	1200 J	660 J
Unknown Aliphatic Hydrocarbon	1300 J				1900 J				
Unknown Aliphatic Hydrocarbon					480 J				
Unknown Aliphatic Hydrocarbon									
Unknown Aliphatic Hydrocarbon									
Unknown Aliphatic Hydrocarbon									
Unknown Aliphatic Hydrocarbon									
Unknown Aliphatic Hydrocarbon									
Unknown Aliphatic Hydrocarbon									
Unknown Hydrocarbon	1900 J	310 J	1900 J		170 J	130 J	160 J		
Unknown Hydrocarbon		460 J					580 J		
Unknown Hydrocarbon							580 J		
Unknown Hydrocarbon							490 J		
Unknown Oxy. Hydrocarbon		1400 J	690 J		210 J			7000 J	
Unknown Oxy. Hydrocarbon			8600 J		230 J				
Unknown Oxy. Hydrocarbon									
Unknown Sesquiterpene					530 J				
Unknown Sesquiterpene					84 J				
Unknown Siloxane									660 J
Unknown	1000 J	120 J	200 J	75 J	130 J	110 J	160 J	2300 J	190 J
Unknown	890 J	500 J	1700 J	130 J	270 J	130 J	180 J	830 J	170 J
Unknown	3800 J	640 J	3700 J	57 J	500 J	590 J	180 J	3000 J	260 J

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9
Unknown	940 J	2300 J	2400 J	150 J	170 J	250 J	250 J	1300 J	570 J
Unknown	2300 J	3700 J	2200 J	94 J	530 J	190 J	580 J	10000 J	450 J
Unknown	5500 J	930 J	2500 J	94 J	290 J	1200 J	900 J	960 J	830 J
Unknown	1300 J	890 J	1500 J	450 J		84 J	720 J	1800 J	920 J
Unknown	1100 J	640 J	2500 J	510 J		110 J	1000 J	1400 J	920 J
Unknown	1200 J	500 J	3100 J	1100 J		1300 J	400 J	960 J	490 J
Unknown	1300 J		1700 J	250 J		150 J		2600 J	890 J
Unknown	110 J		4600 J	210 J		150 J		2800 J	550 J
Unknown			3400 J	1700 J		420 J		790 J	640 J
Unknown				170 J		170 J			570 J
Unknown				110 J		170 J			1100 J
Unknown				190 J					620 J
Unknown				470 J					
Unknown				1800 J					
Unknown				1200 J					

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	SS-9-RE	SS-10	SS-10D	SS-11	SS-12	SS-12RE	SS-13	SS-13RE	SS-14
Aldol Condensation Product			5800 U	2900 U					
Bis Butyl Phenol Isomer	85 U			180 U		110 U			
Molecular Sulfur									1200 J
Pharmaceutical Sulfur									
Unknown Carboxylic Acid	150 BJ		440 BJ	470 BJ	310 BJ	130 BJ			610 BJ
Unknown Carboxylic Acid					470 J	470 J			1600 J
Unknown Carboxylic Acid					1500 J				2400 J
Unknown Carboxylic Acid									
Unknown Aliphatic Hydrocarbon	230 J	420 J	930 J	320 J	310 J	290 J		710 J	1900 J
Unknown Aliphatic Hydrocarbon		770 J	890 J	650 J	790 J	540 J		1100 J	1400 J
Unknown Aliphatic Hydrocarbon		930 J		720 J	650 J	490 J			1100 J
Unknown Aliphatic Hydrocarbon		950 J		360 J	360 J	200 J			
Unknown Aliphatic Hydrocarbon		1200 J							
Unknown Aliphatic Hydrocarbon		810 J							
Unknown Aliphatic Hydrocarbon		930 J							
Unknown Aliphatic Hydrocarbon		460 J							
Unknown Aliphatic Hydrocarbon		750 J							
Unknown Aliphatic Hydrocarbon		230 J							
Unknown Aliphatic Hydrocarbon		310 J							
Unknown Hydrocarbon			750 J						
Unknown Hydrocarbon									
Unknown Hydrocarbon									
Unknown Hydrocarbon									
Unknown Oxy. Hydrocarbon	190 J		860 J	360 J	1900 J	790 J			3200 J
Unknown Oxy. Hydrocarbon			3500 J	1000 J	2700 J	1400 J			4900 J
Unknown Oxy. Hydrocarbon				250 J	380 J	1200 J			4600 J
Unknown Sesquiterpene					2700 J				
Unknown Sesquiterpene									
Unknown Siloxane									
Unknown	110 J	210 J	110 J	220 J	110 J	160 J	2200 J	200 J	320 J
Unknown	110 J	290 J	150 J	290 J	110 J	290 J	1500 J	200 J	810 J
Unknown	510 J	250 J	240 J	870 J	360 J	720 J		820 J	1300 J

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	SS-9-RE	SS-10	SS-10D	SS-11	SS-12	SS-12RE	SS-13	SS-13RE	SS-14
Unknown	190 J	930 J	380 J	290 J	580 J	430 J		910 J	980 J
Unknown	570 J	290 J	240 J	430 J	540 J	200 J		1400 J	1700 J
Unknown	340 J	560 J	220 J	830 J	1900 J	310 J		750 J	7600 J
Unknown	920 J	710 J	440 J	360 J	340 J	250 J		750 J	3200 J
Unknown	530 J	580 J	1200 J	400 J	540 J	270 J		970 J	3400 J
Unknown	300 J	600 J	490 J	320 J	580 J	220 J		1100 J	1400 J
Unknown	570 J		2200 J	540 J		360 J		580 J	2200 J
Unknown	510 J		2000 J					530 J	
Unknown	300 J		860 J					2000 J	
Unknown	260 J		730 J					970 J	
Unknown	190 J							2100 J	
Unknown	300 J							350 J	
Unknown	230 J							530 J	
Unknown								840 J	
Unknown								1200 J	

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (cont.)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	SS-14RE	SBLKS1	SS-11MS	SS-11MSD	MSB
Aldol Condensation Product		6600 AJ			
Bis Butyl Phenol Isomer	150 BJ	66 J			
Molecular Sulfur	780 J				
Pharmaceutical Sulfur	120 J				
Unknown Carboxylic Acid	270 BJ	66 J			
Unknown Carboxylic Acid	410 J				
Unknown Carboxylic Acid	1000 J				
Unknown Carboxylic Acid					
Unknown Aliphatic Hydrocarbon	1300 J				
Unknown Aliphatic Hydrocarbon	1300 J				
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Aliphatic Hydrocarbon					
Unknown Hydrocarbon					
Unknown Hydrocarbon					
Unknown Hydrocarbon					
Unknown Hydrocarbon					
Unknown Oxy. Hydrocarbon	730 J				
Unknown Oxy. Hydrocarbon	2200 J				
Unknown Oxy. Hydrocarbon	1500 J				
Unknown Sesquiterpene					
Unknown Sesquiterpene					
Unknown Siloxane					
Unknown	200 J				
Unknown	220 J				
Unknown	440 J				

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (cont.)

CASE NO. 9102.414

All results reported in ug/kg

Tentatively Identified Compounds	SS-14RE	SBLKS1	SS-11MS	SS-11MSD	MSB
Unknown	460 J				
Unknown	1800 J				
Unknown	1900 J				
Unknown	1900 J				
Unknown	950 J				
Unknown	1400 J				
Unknown					
Unknown					
Unknown					
Unknown					
Unknown					
Unknown					
Unknown					
Unknown					
Unknown					

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.414

All results reported in ug/L

Tentatively Identified Compounds	(MH-4) L-1	(PS2)L-2	SBLKW1	PS2(L2) MS	PS2(L2) MSD	MSB1
Unknown Aliphatic Hydrocarbons	45 J					
Unknown Organic Acid		19 J				
Unknown Carboxylic Acid		8.0 J				
Unknown Hydrocarbon		9.0 J				
Unknown	8.0 J	4.0 J				
Unknown	4.0 J	10 J				
Unknown	5.0 J	5.0 J				
Unknown	5.0 J	7.0 J				
Unknown	11 J	6.0 J				

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.556

All results reported in ug/L

Tentatively Identified Compounds	GW-1D	GW-2D	GW-2DRE	GW-3D	GW-3S	GW-4D	GW-8S	GW-9D	GW-10D	GW-10S	GW-10SRE
Nonyl Phenol Isomer							9.0 J				
Unknown Aliphatic Hydrocarbon	6.0 J										
Unknown Aliphatic Hydrocarbon	9.0 J										
Unknown Aliphatic Hydrocarbon	11 J										
Unknown Aliphatic Hydrocarbon	10 J										
Unknown Aliphatic Hydrocarbon	8.0 J										
Unknown Aliphatic Hydrocarbon	6.0 J										
Unknown Hydrocarbon			7.0 BJ				9.0 BJ		12 J		39 BJ
Unknown Hydrocarbon							5.0 BJ				
Unknown Carboxylic Acid							4.0 J				
Unknown	33 BJ	8.0 BJ	31 BJ	7.0 BJ	8.0 BJ	6.0 BJ	8.0 J	8.0 BJ	8.0 BJ	10 BJ	30 BJ
Unknown	8.0 BJ	11 J	6.0 BJ	36 BJ	37 BJ	32 BJ	7.0 J	36 BJ	39 BJ	4.0 J	6.0 BJ
Unknown	4.0 J	7.0 J		8.0 BJ	7.0 BJ	6.0 BJ	29 BJ	6.0 BJ	7.0 BJ	11 J	4.0 BJ
Unknown	4.0 BJ	37 BJ		4.0 BJ	5.0 BJ		5.0 BJ	4.0 BJ	5.0 BJ	8.0 J	
Unknown		7.0 BJ								38 BJ	
Unknown		5.0 BJ								8.0 BJ	
Unknown										5.0 J	
Unknown										5.0 BJ	

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.556

All results reported in ug/L

Tentatively Identified Compounds	SBLKW1	SBLKW2	GW-10DMS	GW-10DMSD
Nonyl Phenol Isomer				
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Aliphatic Hydrocarbon				
Unknown Hydrocarbon		8.0 J		
Unknown Hydrocarbon				
Unknown Carboxylic Acid				
Unknown	8.0 J	32 J		
Unknown	40 J	6.0 J		
Unknown	9.0 J	4.0 J		
Unknown	5.0 J			
Unknown				
Unknown				
Unknown				
Unknown				

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Tentatively Identified Compounds	GW-6S	GW-7D	GW-11S	GW-11SDD	GW-11SDDRE	GW-12D	GW-13D	GW-13DRE	GW-13S	SBLKW1	SBLKW2
Aldol Condensation Product											
Nonyl Phenol Isomer								7.0 J			
Unknown Hydrocarbon	7.0 J	6.0 J	5.0 J	5.0 J	6.0 BJ	16 J			10 J		8.0 J
Unknown	8.0 BJ	7.0 BJ	7.0 BJ	8.0 BJ	6.0 J	49 BJ	11 J	21 J	51 BJ	50 J	32 J
Unknown	40 BJ	38 BJ	7.0 J	7.0 J	7.0 J	9.0 BJ	10 J	29 BJ	9.0 BJ	9.0 J	6.0 J
Unknown	6.0 BJ	6.0 BJ	7.0 J	5.0 J	9.0 J	5.0 BJ	50 BJ	6.0 BJ	5.0 BJ	5.0 J	4.0 J
Unknown	5.0 BJ	4.0 BJ	37 BJ	42 BJ	33 BJ		9.0 BJ				
Unknown			6.0 BJ	9.0 BJ	5.0 BJ		5.0 BJ				
Unknown			4.0 BJ	5.0 BJ	5.0 BJ						
Unknown					4.0 BJ						
Unknown					94 BJ						

DRAFT

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY (continued)

CASE NO. 9102.587

All results reported in ug/L

Tentatively Identified Compounds	SBLKW3	SBLKW4	SBLKW5	DW-2MS	DW-2MSD
Aldol Condensation Product		24 J			
Nonyl Phenol Isomer					
Unknown Hydrocarbon		6.0 J	24 J		
Unknown	9.0 J	36 J	39 J		
Unknown	39 J	9.0 J	8.0 J		
Unknown	5.0 J	4.0 J	5.0 J		
Unknown	5.0 J		5.0 J		
Unknown					
Unknown					
Unknown					
Unknown					

WELLSVILLE/ANDOVER LANDFILL SITE

TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/WATER - DATA SUMMARY

CASE NO. 9102.587

All results reported in ug/L

Tentatively Identified Compounds	DW-1	DW-2	DW-3	DW-4	DW-5	DW-5D	DW-6	DW-7	GW-5D	GW-5S	GW-6D
Aldol Condensation Product					50 U	390 AJ	63 U				
Nonyl Phenol Isomer											
Unknown Hydrocarbon	5.0 J										6.0 J
Unknown	59 BJ	52 BJ	44 BJ	55 BJ	9.0 J	40 BJ	8.0 J	7.0 J	6.0 BJ	4.0 J	8.0 BJ
Unknown	10 BJ	9.0 BJ	7.0 BJ	9.0 BJ	46 BJ	9.0 BJ	40 BJ	37 BJ	5.0 J	39 BJ	7.0 J
Unknown	4.0 J	5.0 BJ	4.0 BJ	6.0 BJ	11 BJ	5.0 BJ	10 BJ	7.0 BJ	4.0 J	7.0 BJ	6.0 J
Unknown	7.0 BJ				5.0 BJ		4.0 BJ	4.0 BJ	34 BJ	5.0 BJ	41 BJ
Unknown	6.0 J				4.0 BJ		5.0 BJ		6.0 BJ		7.0 BJ
Unknown							4.0 J				5.0 BJ
Unknown											
Unknown											

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY

CASE NO. 9103.051

All results reported in ug/kg

Tentatively Identified Compounds	TP-1	TP-2	TP-3	TP-4	TP-5	SBLKS1
Aldol Condensation Product	35000 U	17000 U	12000 U	14000 U	20000 U	7500 AJ
Phenyl Acetic Acid	2200 J		610 J			
Phenyl Propanoic Acid	3900 J		590 J			
Molecular Sulfur	17000 J	8700 J	1500 J		3600 J	
Terpene Isomer		2200 J				
Octyl Phenol Isomer			360 J			
Benzaldehyde				45000 J	1500 J	
Acetophenone				7700 J		
Benzoic Acid				22000 J		
Methyl Phenylacetate				3600 J		
Chalcone				19000 J		
Phthalic Anhydride					800 J	
Tetrachlorophenol Isomer					1100 J	
Unknown Carboxylic Acid	2400 J	4300 J	820 J	5500 J	1200 J	
Unknown Carboxylic Acid	120000 J	20000 J	4600 J	18000 J	13000 J	
Unknown Carboxylic Acid	50000 J	1200 J	800 J	13000 J	6400 J	
Unknown Carboxylic Acid	6300 J	1800 J	2500 J	11000 J		
Unknown Carboxylic Acid	98000 J	2400 J	1400 J			
Unknown Carboxylic Acid	18000 J	16000 J	400 J			
Unknown Carboxylic Acid	2100 J		1500 J			
Unknown Carboxylic Acid	44000 J		1200 J			
Unknown Carboxylic Acid	12000 J		6500 J			
Unknown Carboxylic Acid	16000 J		1500 J			
Unknown Carboxylic Acid	8300 J		2900 J			
Unknown Carboxylic Acid			380 J			
Unknown Carboxylic Acid			1600 J			
Unknown Hydrocarbon	6100 J	3600 J			910 J	
Unknown Hydrocarbon	7200 J	3200 J			2700 J	
Unknown Hydrocarbon	8500 J	4000 J			3000 J	
Unknown Hydrocarbon	8700 J				3400 J	
Unknown Hydrocarbon	8500 J					
Unknown Oxy. Hydrocarbon		24000 J	460 J			

WELLSVILLE/ANDOVER LANDFILL SITE
TENTATIVELY IDENTIFIED COMPOUNDS
SEMI-VOLATILES/SOIL - DATA SUMMARY (continued)

CASE NO. 9103.051

All results reported in ug/kg

Tentatively Identified Compounds	TP-1	TP-2	TP-3	TP-4	TP-5	SBLKS1
Unknown Oxy. Hydrocarbon		17000 J				
Unknown Alkyl Benzyl Alcohol				45000 J		
Unknown		1200 J	440 J	11000 J	770 J	
Unknown		1700 J		9100 J	2100 J	
Unknown		3800 J		14000 J	4100 J	
Unknown		22000 J		10000 J	3900 J	
Unknown		19000 J		24000 J		
Unknown		8100 J		12000 J		
Unknown				14000 J		
Unknown				14000 J		
Unknown				20000 J		

DATA QUALIFIERS

NYSDEC SSP DATA QUALIFIERS

ORGANIC DATA QUALIFIERS

U -	Indicates that the compound was analyzed for but not detected at or above the Contract Required Quantitation Limit (CRQL).
J -	The associated numerical value is an estimated quantity.
UJ-	The compound was analyzed for, but not detected. The sample quantitation limit is an estimated quantity due to variance in quality control limits.
B -	The analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.
C -	Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution.
M -	Matrix spike compound.
E -	Reported value is estimated because it exceeds the calibration limit.
D -	Reported result taken from diluted sample analysis.
A -	Aldol condensation product.
R -	Reported value is unusable and rejected due to variance from quality control limits.

NYSDEC SSP DATA QUALIFIERS

INORGANIC DATA QUALIFIERS

U - Indicates analyte result less than Contract Required Detection Limit (CRDL).

B - Indicates analyte result between Instrument Detection Limit (IDL) and CRDL.

J - Reported value is estimated due to variance from quality control limits identified during data validation procedures.

UJ- The element was analyzed for, but not detected. The sample quantitation limit is an estimate due to variance in quality control limits.

E - Reported value is estimated because of the presence of interference.

APPENDIX E

RESULTS OF GEOTECHNICAL ANALYSES

DRAFT

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: WELLSVILLE-ANDOVER LANDFILL
PROJECT NO. R5977.10
PROJECT ENGINEER: R. WATT
MATERIAL SOURCE: WELLSVILLE-ANDOVER LANDFILL SITE
DATE ASSIGNED: 12/16/91
WORK ORDER NO. 1552

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE LOCATION	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
MW-1D	1Da	0.0-2.0	16.4	39	24	15	55	18								Light Yellowish Brown to Olive Brown Gravelly Lean Clay with Sand (CL)
MW-2D	2Da	4.0-6.0	13.3	37	22	15	54	16								Light Olive Brown Gravelly Lean Clay with Sand (CL)
MW-3D	3Da	5.0-6.0	13.3	33	20	13	56	19								Light Olive Brown Sandy Lean Clay with Gravel (CL)
MW-3D	3Db	22.0-24.0	10.2	36	19	17	42	16								Light Yellowish Brown Clayey Gravel with Sand (GC)
MW-4D	4Da	1.0-2.0	6.1	32	21	11	31	10								Light Yellowish Brown Clayey Sand with Gravel and Organic Matter (SC)
MW-5D	5Da	8.0-10.0	6.7	33	19	14	28	10								Light Olive Brown Clayey Sand with Gravel (SC)
MW-6D	6Da	2.0-4.0	9.4	36	20	16	53	19								Light Olive Brown Sandy Lean Clay with Gravel (CL)
MW-6D	6Db	12.0-14.0	19.2	35	21	14	44	16								Light Olive Brown Clayey Gravel with Sand (GC)
MW-7D	7Da	10.5-11.0	9.2	31	19	12	53	17								Light Olive Brown Sandy Lean Clay with Gravel (CL)
MW-7D	7Db	20.0-22.0	5.5	33	19	14	47	17								Light Olive Brown Clayey Sand with Gravel (SC)
MW-8D	8Da	1.0-3.0	12.6	36	23	13	62	19								Light Olive Brown Sandy Lean Clay with Gravel (CL)
MW-8D	8Db	11.0-12.0	13.2	33	19	14	54	20								Olive Brown Sandy Lean Clay with Gravel (CL)
MW-8D	8Dc	43.0-44.0	12.1	29	18	11	52	15								Olive Sandy Lean Clay with Gravel (CL)
MW-9D	9Da	1.0-3.0	8.9	32	19	13	47	17								Light Olive Brown Clayey Gravel with Sand (GC)
MW-9D	9Db	14.0-16.0	10.3	28	17	11	46	14								Olive Brown Clayey Gravel with Sand (GC)

DRAFT

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: WELLSVILLE-ANDOVER LANDFILL
PROJECT NO. R5977.10
PROJECT ENGINEER: R. WATT
MATERIAL SOURCE: WELLSVILLE-ANDOVER LANDFILL SITE
DATE ASSIGNED: 12/16/91
WORK ORDER NO. 1552

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE LOCATION	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
MW-10D	10Da	1.0-3.0	14.4	39	21	18	73	23								Light Olive Brown Lean Clay with Gravel (CL)
MW-10D	10Db	8.0-10.0	16.3	24	19	5	60	9								Olive Brown Sandy Silty Clay with Gravel (CL-ML)
MW-11S	11Sa	17.0-18.0	18.1	28	17	11	61	19								Light Olive Brown Sandy Lean Clay (CL)
MILLER SPRING	CL-1	1.5-2.0	20.5	37	25	12	71	24								Light Olive Brown Silt with Sand (ML)

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LEGEND FOR GEOTECHNICAL LABORATORY DATA SUMMARY SHEET

WATER CONTENT (ASTM D 2216)

% = WATER CONTENT IN PERCENT

ATTERBERG LIMITS (ASTM D 4318)

LL % = LIQUID LIMIT IN PERCENT

PL % = PLASTIC LIMIT IN PERCENT

PI = PLASTICITY INDEX

GRAIN SIZE ANALYSIS (ASTM D 422)

SIEVE -200 % = PERCENT FINES, MATERIAL FINER THAN NO. 200 SIEVE (0.074 MM)

HYD. -2μ % = PERCENT FINER THAN 2 MICRONS

MOISTURE-DENSITY RELATIONSHIP (Modified) (ASTM D 1557)

MAX. DRY DENSITY pcf = MAXIMUM DRY DENSITY IN POUNDS PER CUBIC FOOT

OPT. WATER CONTENT % = OPTIMUM WATER CONTENT IN PERCENT

PERMEABILITY TEST (U.S. ARMY CORPS. OF ENGINEERS EM-1110-2-1906)

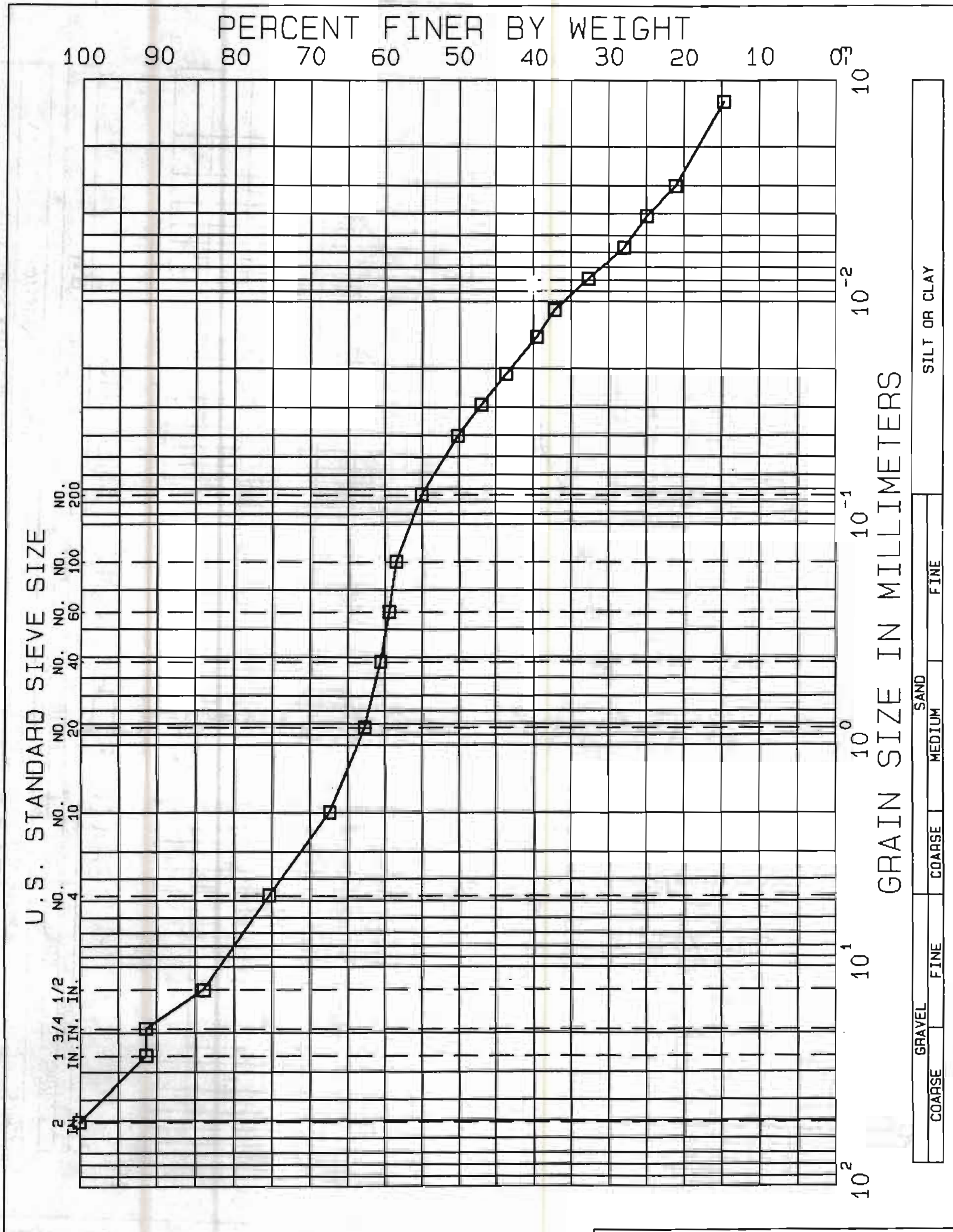
PERMEABILITY cm/sec. = PERMEABILITY MEASURED IN CENTIMETERS PER SECOND

TYPE OF TEST Kr = RECONSTITUTED (REMOLDED) SAMPLE
K = UNDISTURBED SAMPLE

$\bar{\sigma}_c$ psf = EFFECTIVE CONFINING PRESSURE DURING PERMEABILITY TEST IN POUNDS PER SQUARE FOOT

DRY UNIT WT. pcf = DRY DENSITY OF TEST SAMPLE IN POUNDS PER CUBIC FOOT

WATER CONTENT % = WATER CONTENT OF TEST SAMPLE IN PERCENT



TEST NO.
D 422

MATERIAL SOURCE
Sample Location MW-1D
Depth 0.0-2.0 ft.

SAMPLE DESCRIPTION
Light Yellowish Brown
to Olive Brown Gravelly
Lean Clay with Sand (CL)

WELLSVILLE-ANDOVER LANDFILL

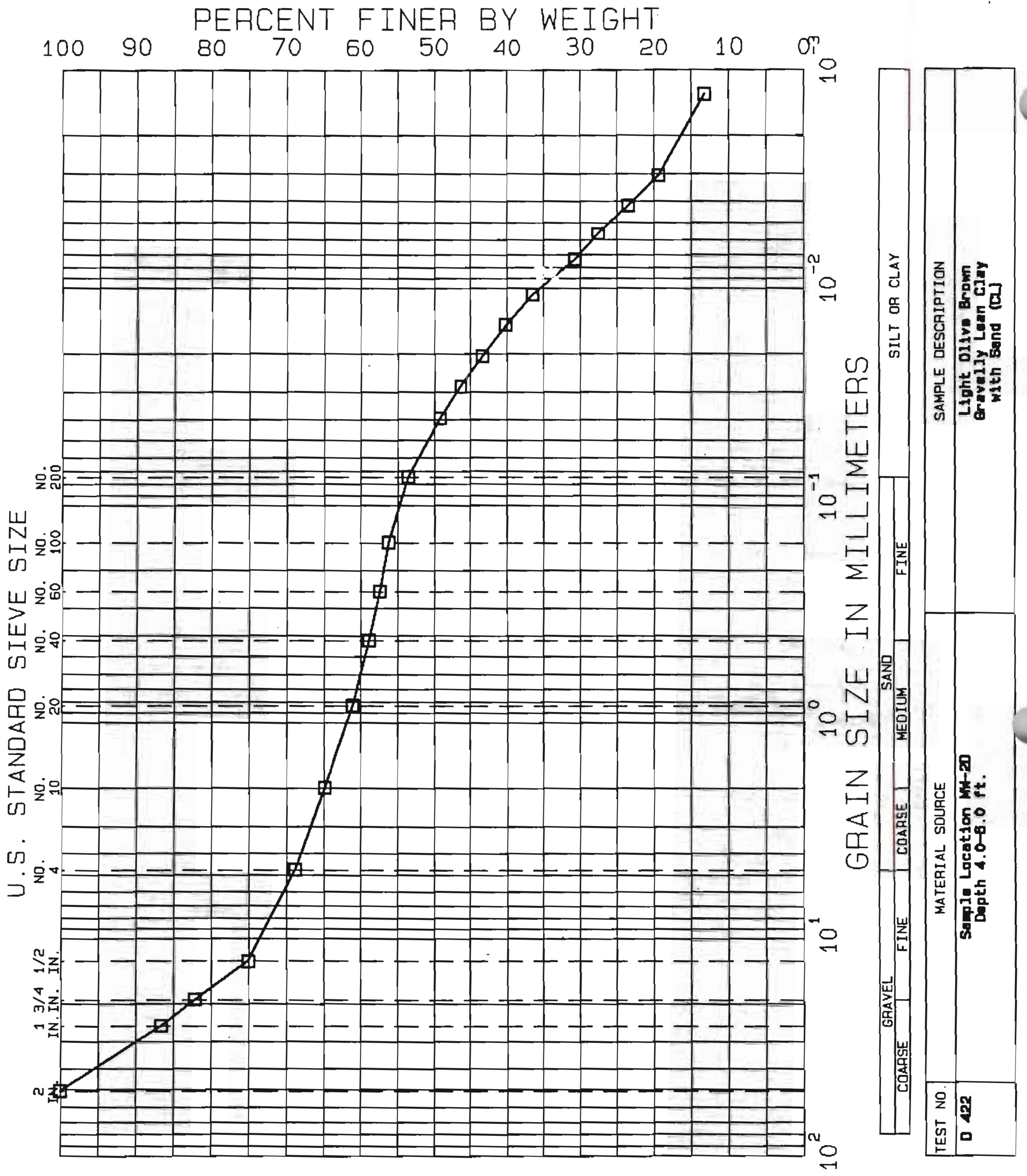
GRADATION TESTS

EXPLOR. NO. MW-1D
SANPLE NO. 1Da
DEPTH 0.0-2.0 ft.
TECH. WGL
REVIEWER RAR

WORK ORDER
NO. 1552
DATE 1/6/92

FILE R5977.10

D R A F T



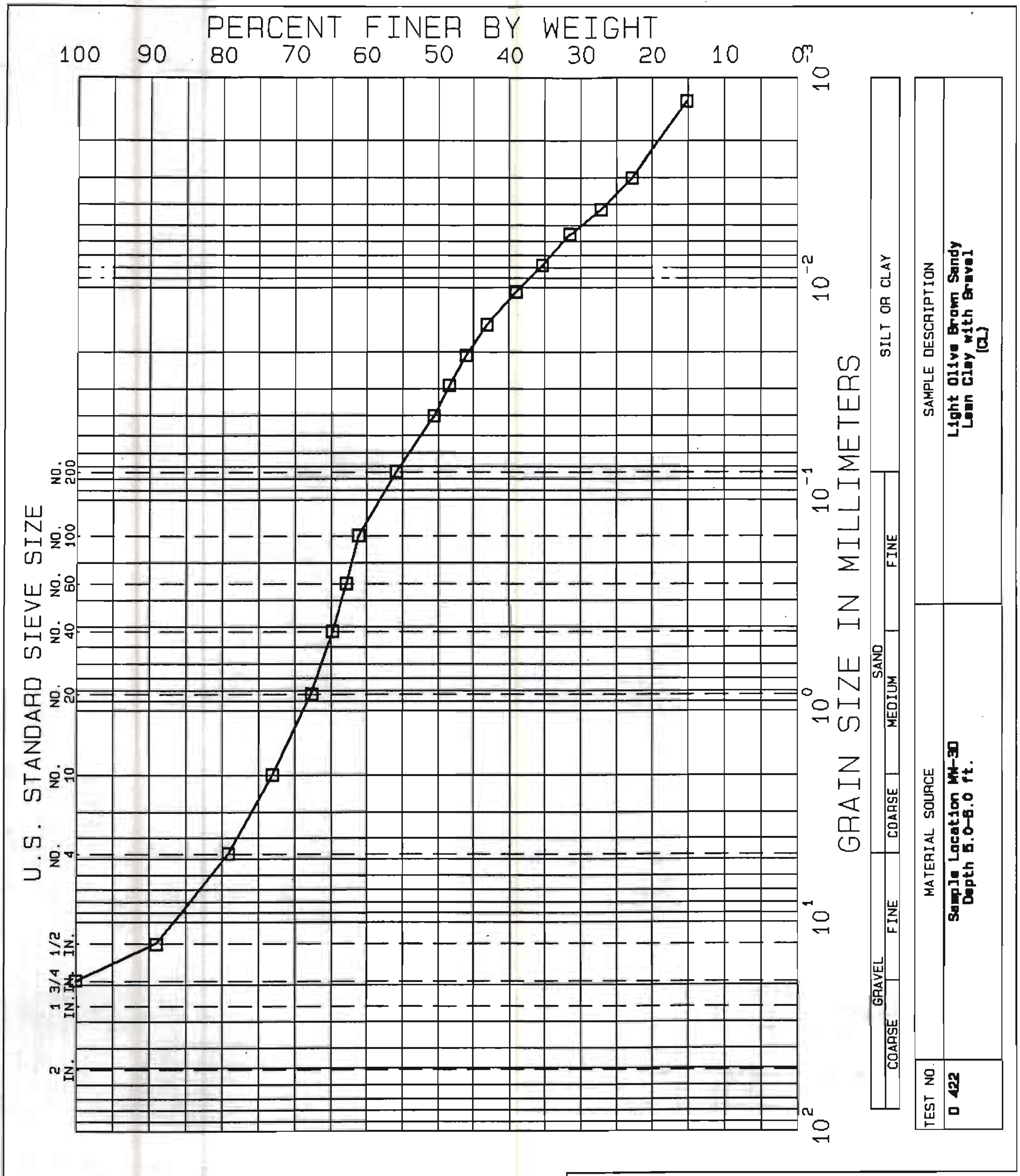
TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	Sample Location MW-20 Depth 4.0-6.0 ft.	Light Olive Brown Gravelly Lean Clay with Sand (CL)

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. MW-20
SAMPLE NO. 20a
DEPTH 4.0-6.0 ft.
TECH. WGL
REVIEWER RAR

WORK ORDER NO. 1552
DATE 1/2/92
FILE R5977.10



SAMPLE DESCRIPTION
Light Olive Brown Sandy Lean Clay with Gravel (CL)

MATERIAL SOURCE
Sample Location MW-3D Depth 5.0-6.0 ft.

TEST NO. **D 422**

WELLSVILLE-ANDOVER LANDFILL

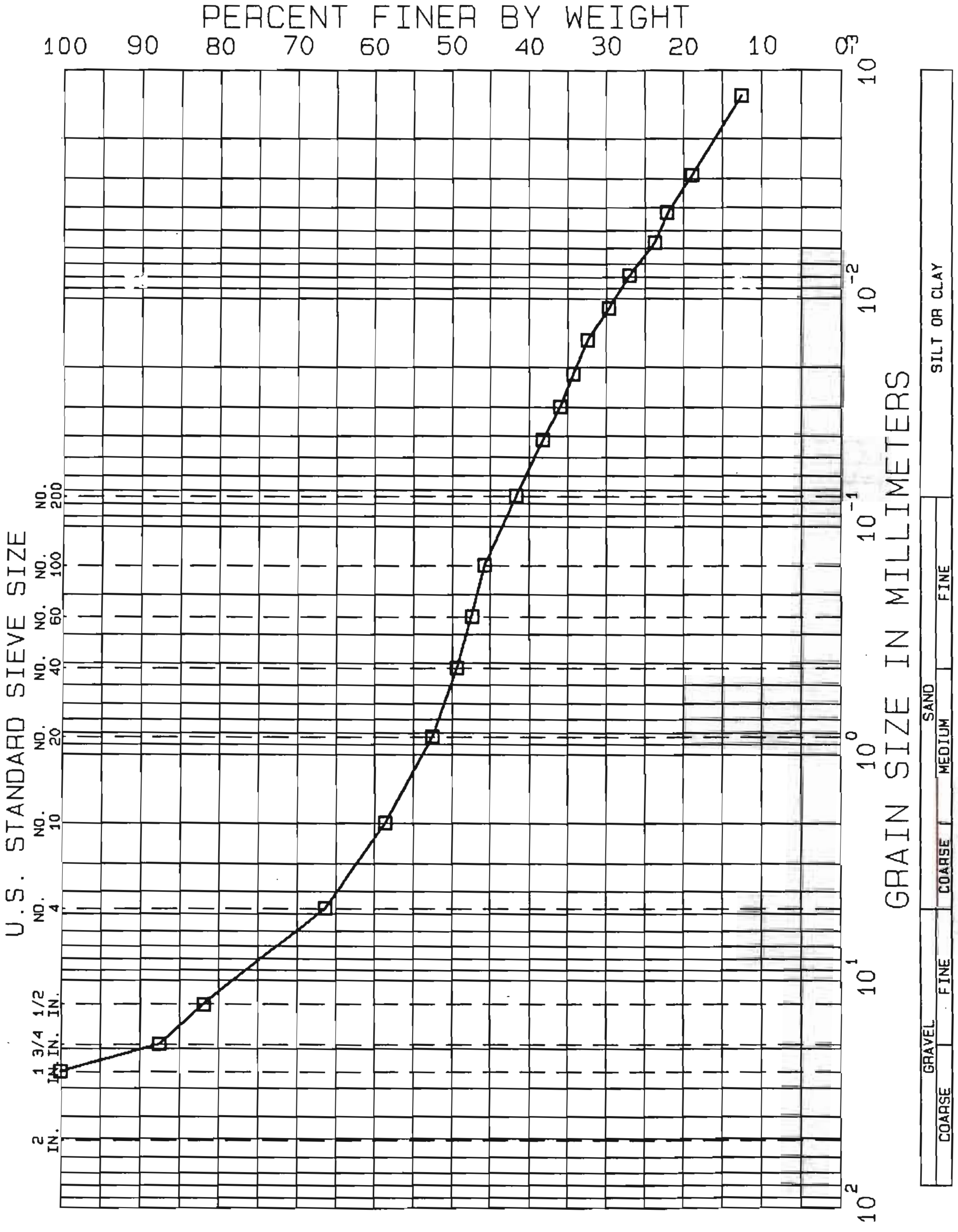
GRADATION TESTS

EXPLOR. NO. **MW-3D**
SAMPLE NO. **3Da**
DEPTH **5.0-6.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER NO. **1552**
DATE **1/2/92**

FILE **R5977.10**

D R A F T



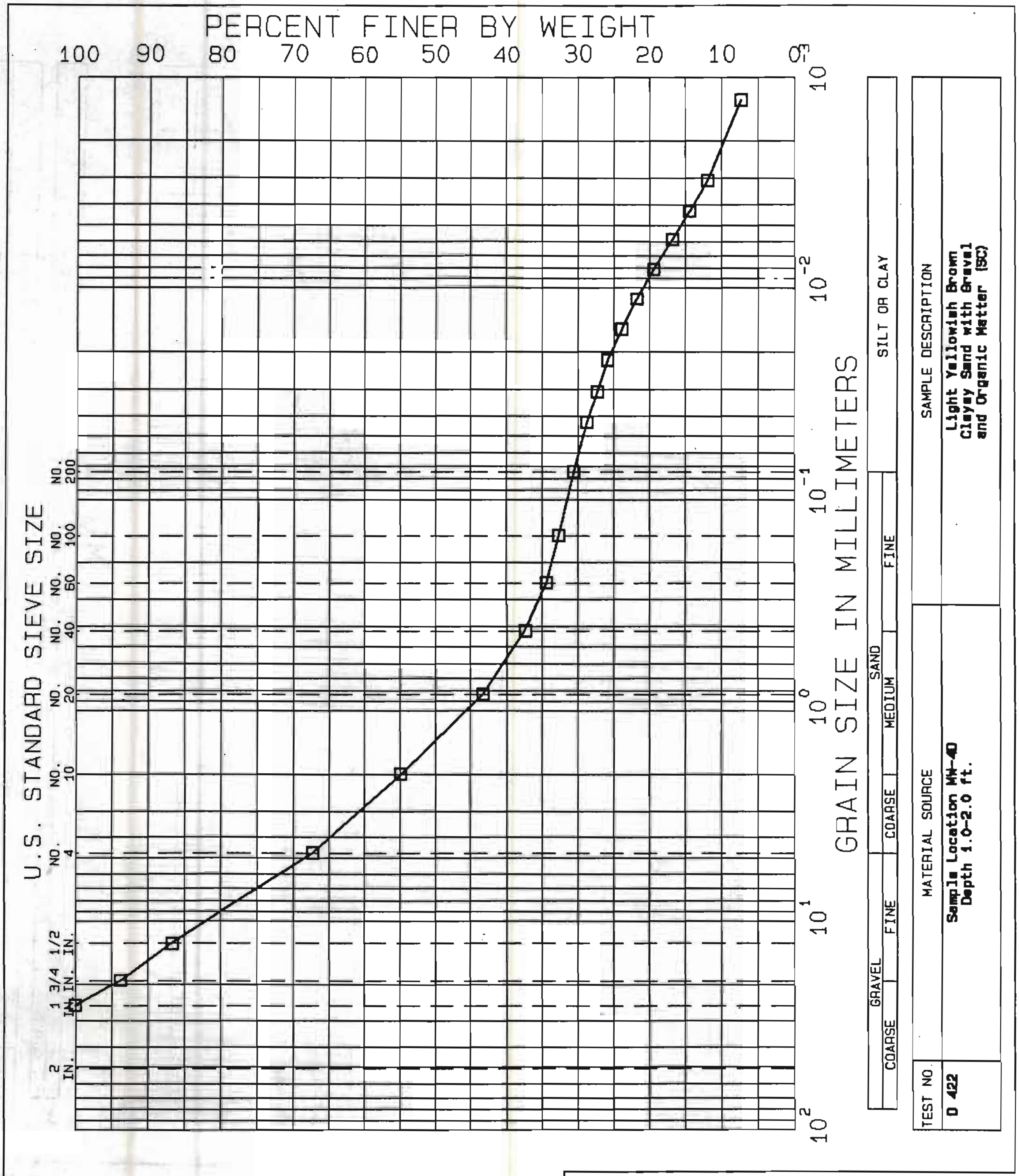
SAMPLE DESCRIPTION	**Light Yellowish Brown Clayey Gravel with Sand (GC)**
MATERIAL SOURCE	**Sample Location MW-3D Depth 22.0-24.0 ft.**
TEST NO.	**D 422**

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. **MW-3D**
SAMPLE NO. **3Db**
DEPTH **22.0-24.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER NO. **1552**
DATE **1/2/92**
FILE **R5977.10**



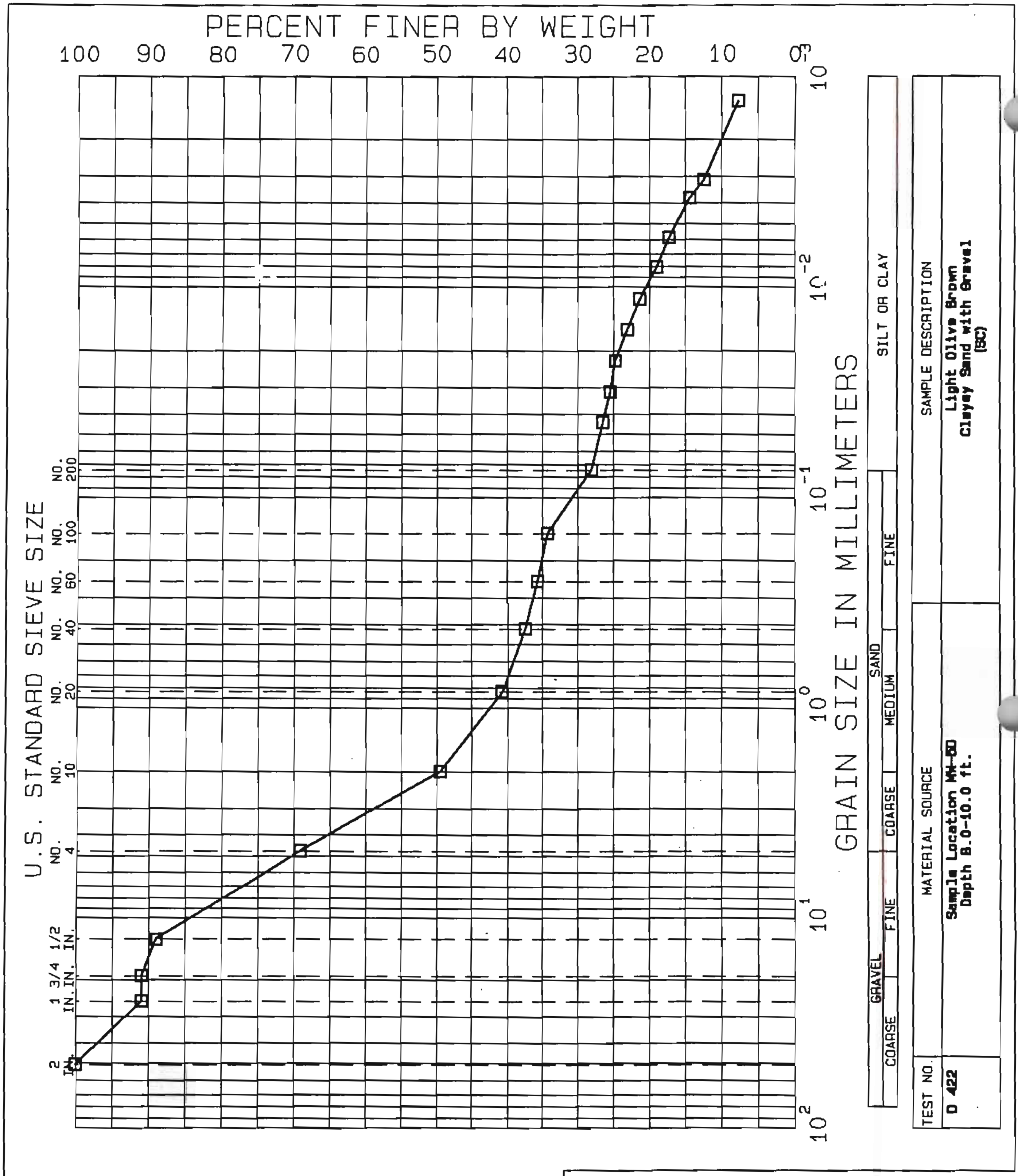
TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	Sample Location MW-4D Depth 1.0-2.0 ft.	Light Yellowish Brown Clayey Sand with Gravel and Organic Matter (SC)

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO.	MW-4D	WORK ORDER NO.	1552
SAMPLE NO.	4Dm	DATE	1/8/92
DEPTH	1.0-2.0 ft.		
TECH.	WGL		
REVIEWER	RAR	FILE	R5977.10

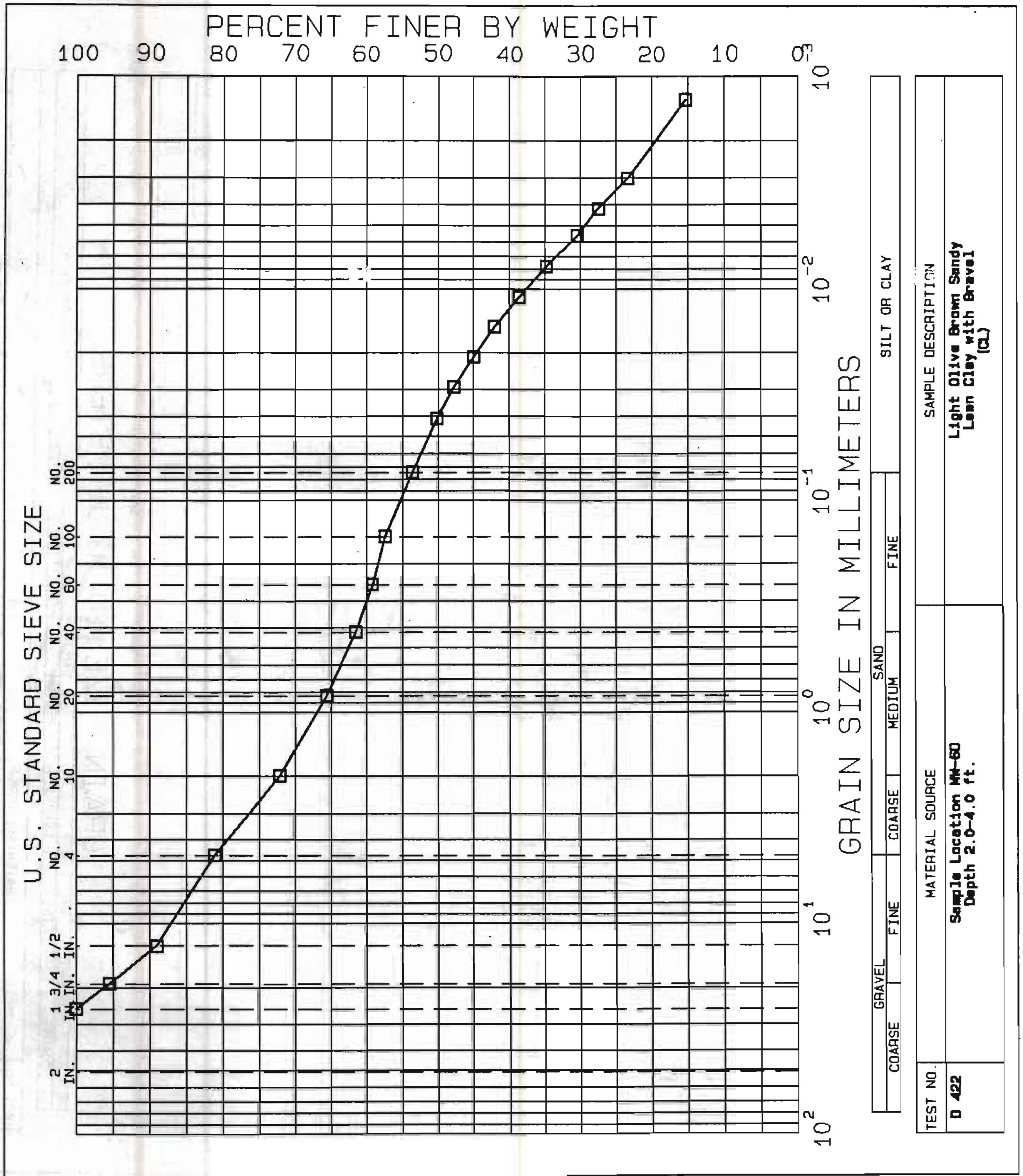
D R A F T



WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO.	MW-5D	WORK ORDER NO.	1552
SANPLE NO.	5Da	DATE	1/2/92
DEPTH	8.0-10.0 ft.		
TECH.	WGL		
REVIEWER	RAR	FILE	R5977.10



SAMPLE DESCRIPTION
Light Olive Brown Sandy Lean Clay with Gravel (CL)

MATERIAL SOURCE
Sample Location MW-6D Depth 2.0-4.0 ft.

TEST NO. **D 422**

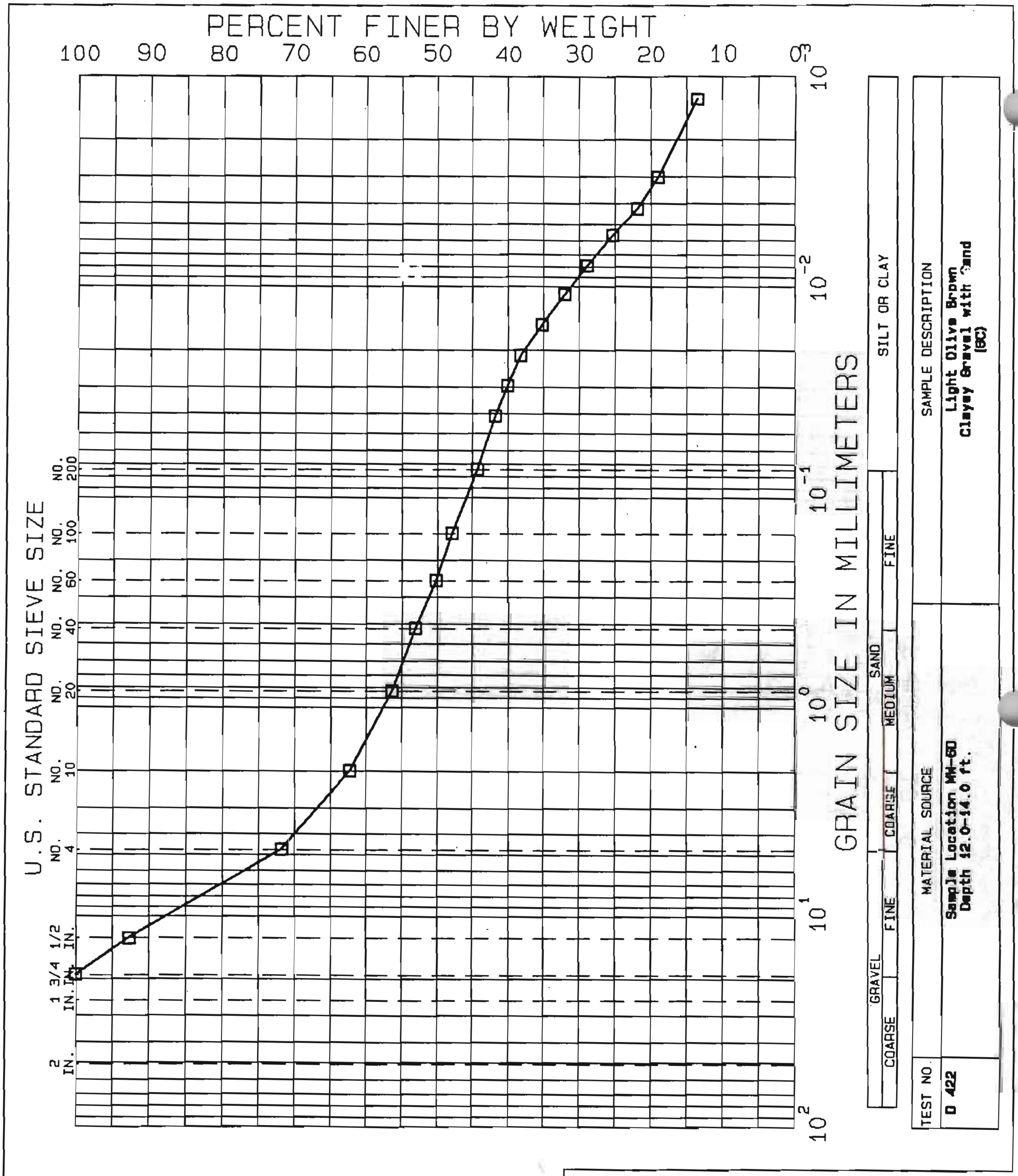
WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. **MW-6D**
SAMPLE NO. **6Da**
DEPTH **2.0-4.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER NO. **1552**
DATE **1/2/92**

FILE **R5977.10**



TEST NO.
D 422

MATERIAL SOURCE
Sample Location MW-8D
Depth 12.0-14.0 ft.

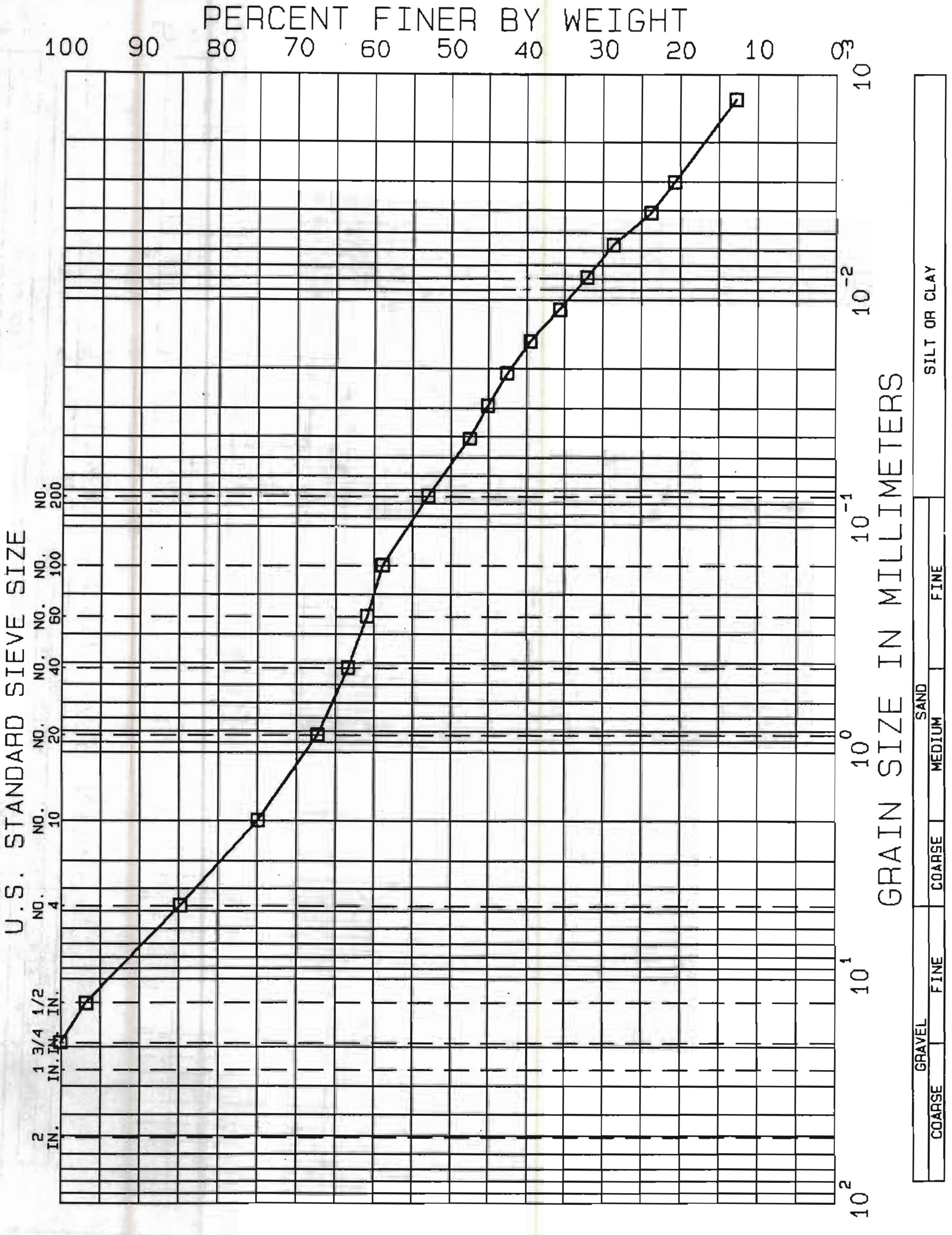
SAMPLE DESCRIPTION
Light Olive Brown
Clayey Gravel with Sand
(GC)

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO.	**MW-8D**	WORK ORDER NO.	**1552**
SAMPLE NO.	**6Db**	DATE	**1/2/92**
DEPTH	**12.0-14.0 ft.**		
TECH.	**WGL**		
REVIEWER	**RAR**	FILE	**R5977.10**

D R A F T



TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	Sample Location MW-7D Depth 10.5-11.0 ft.	Light Olive Brown Sandy Lean Clay with Gravel (CL)

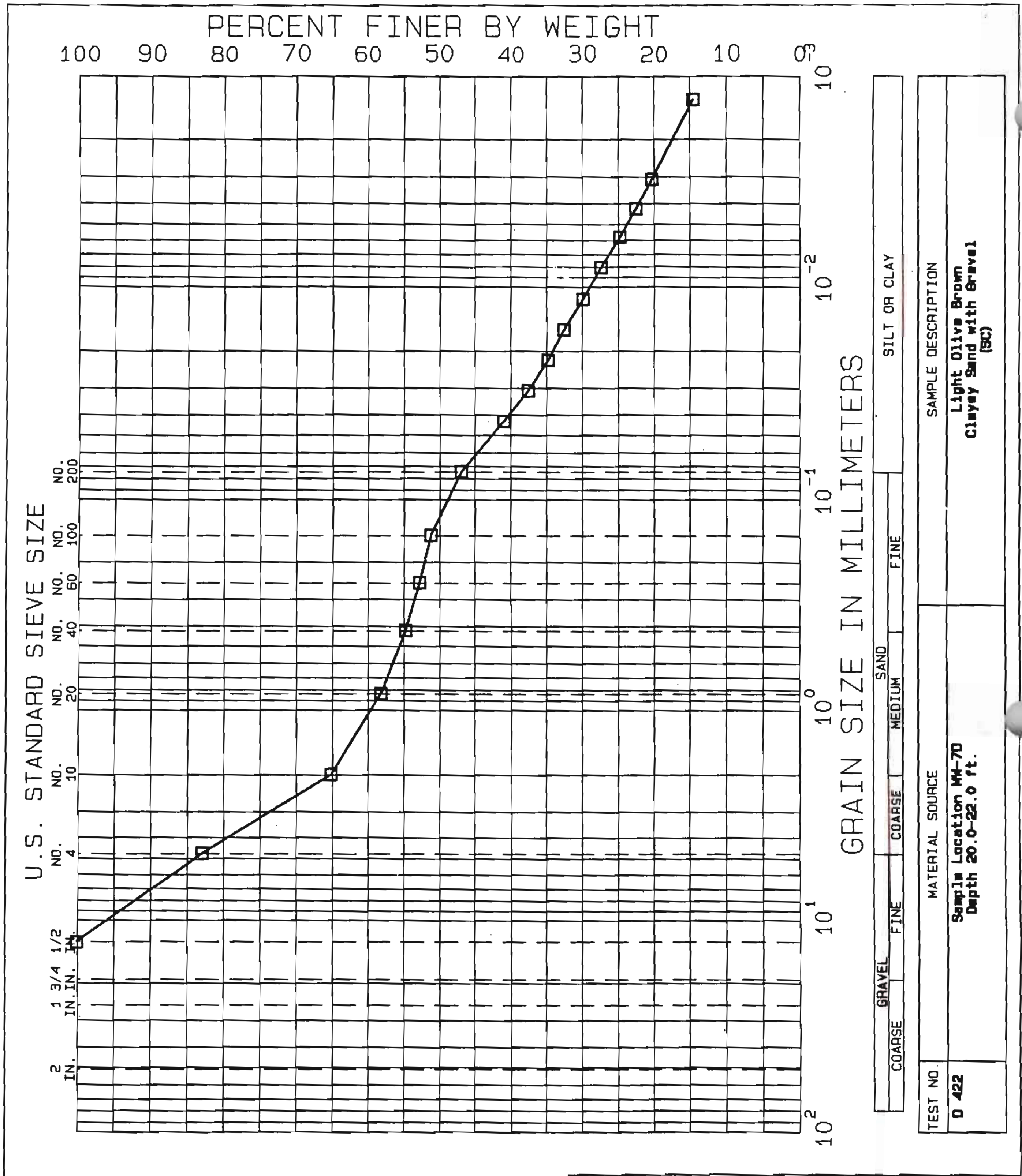
WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. MW-7D
SAMPLE NO. 7Da
DEPTH 10.5-11.0 ft.
TECH. WGL
REVIEWER RAR

WORK ORDER NO. 1552
DATE 1/2/92
FILE R5977.10

D R A F T



SAMPLE DESCRIPTION
Light Olive Brown Clayey Sand with Gravel (SC)

MATERIAL SOURCE
Sample Location MW-7D Depth 20.0-22.0 ft.

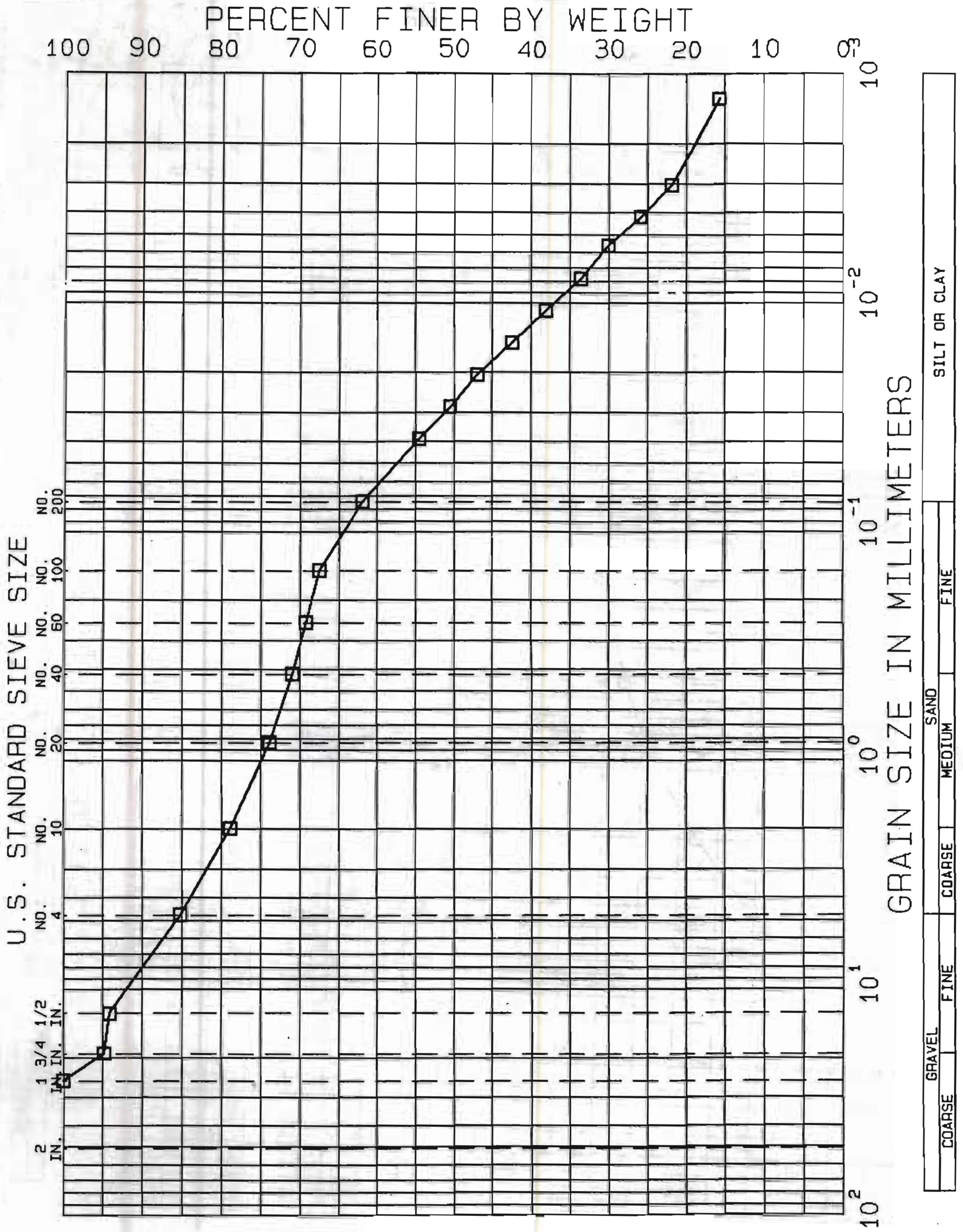
TEST NO. **D 422**

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO.	**MW-7D**	WORK ORDER NO.	**1552**
SAMPLE NO.	**7Db**	DATE	**1/2/92**
DEPTH	**20.0-22.0 ft.**		
TECH.	**WGL**		
REVIEWER	**RAR**	FILE	**R5977.10**

DRAFT



SAMPLE DESCRIPTION
Light Olive Brown Sandy Lean Clay with Gravel (CL)

MATERIAL SOURCE
Sample Location MW-8D Depth 1.0-3.0 ft.

TEST NO.
D 422

WELLSVILLE-ANDOVER LANDFILL

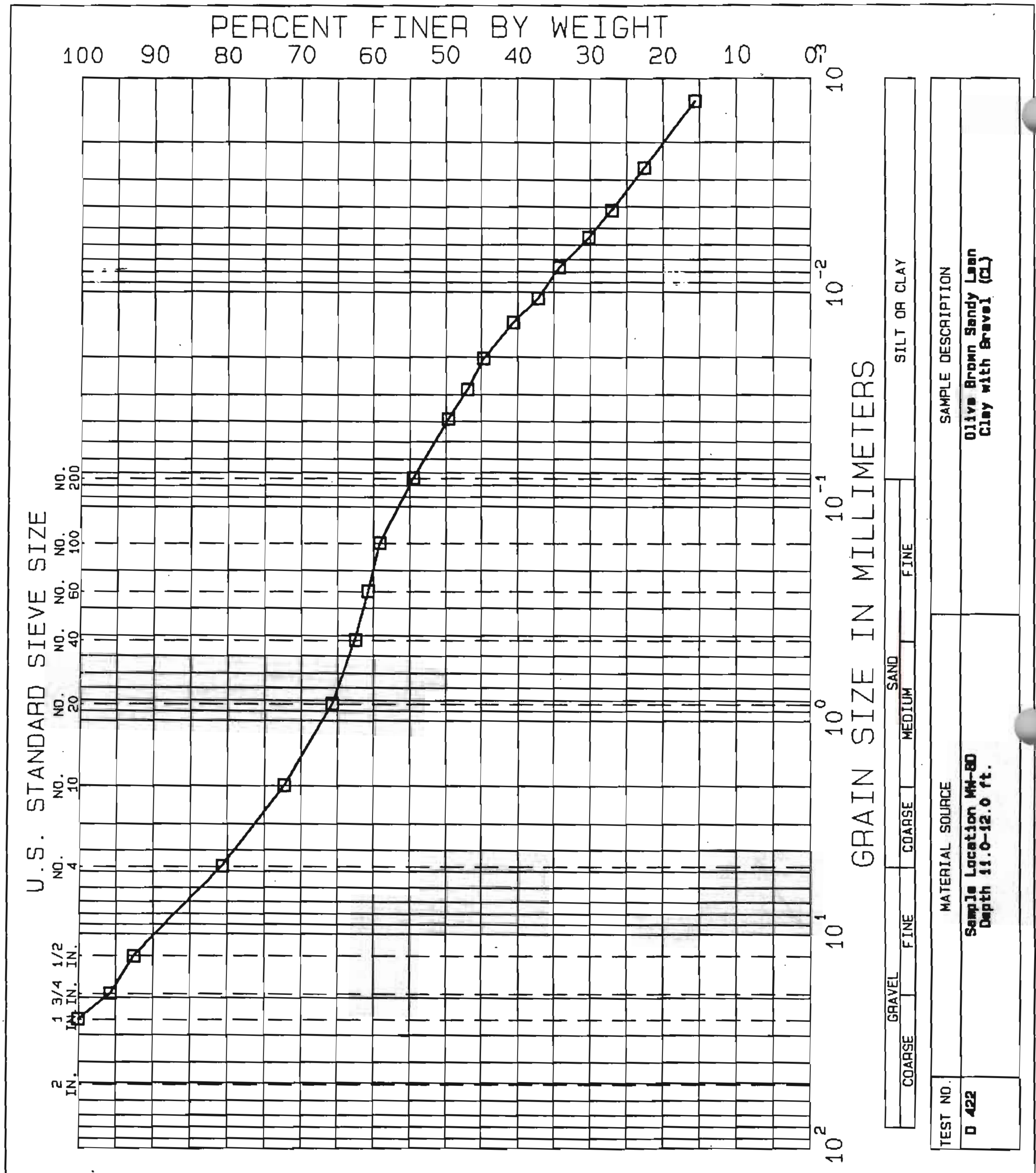
GRADATION TESTS

EXPLOR. NO. MW-8D
SAMPLE NO. 8Da
DEPTH 1.0-3.0 ft.
TECH. WGL
REVIEWER RAR

WORK ORDER NO. 1552
DATE 1/2/92

FILE R5977.10

DRAFT



TEST NO.: D 422

MATERIAL SOURCE: Sample Location MW-8D Depth 11.0-12.0 ft.

SAMPLE DESCRIPTION: Olive Brown Sandy Lean Clay with Gravel (CL)

WELLSVILLE-ANDOVER LANDFILL

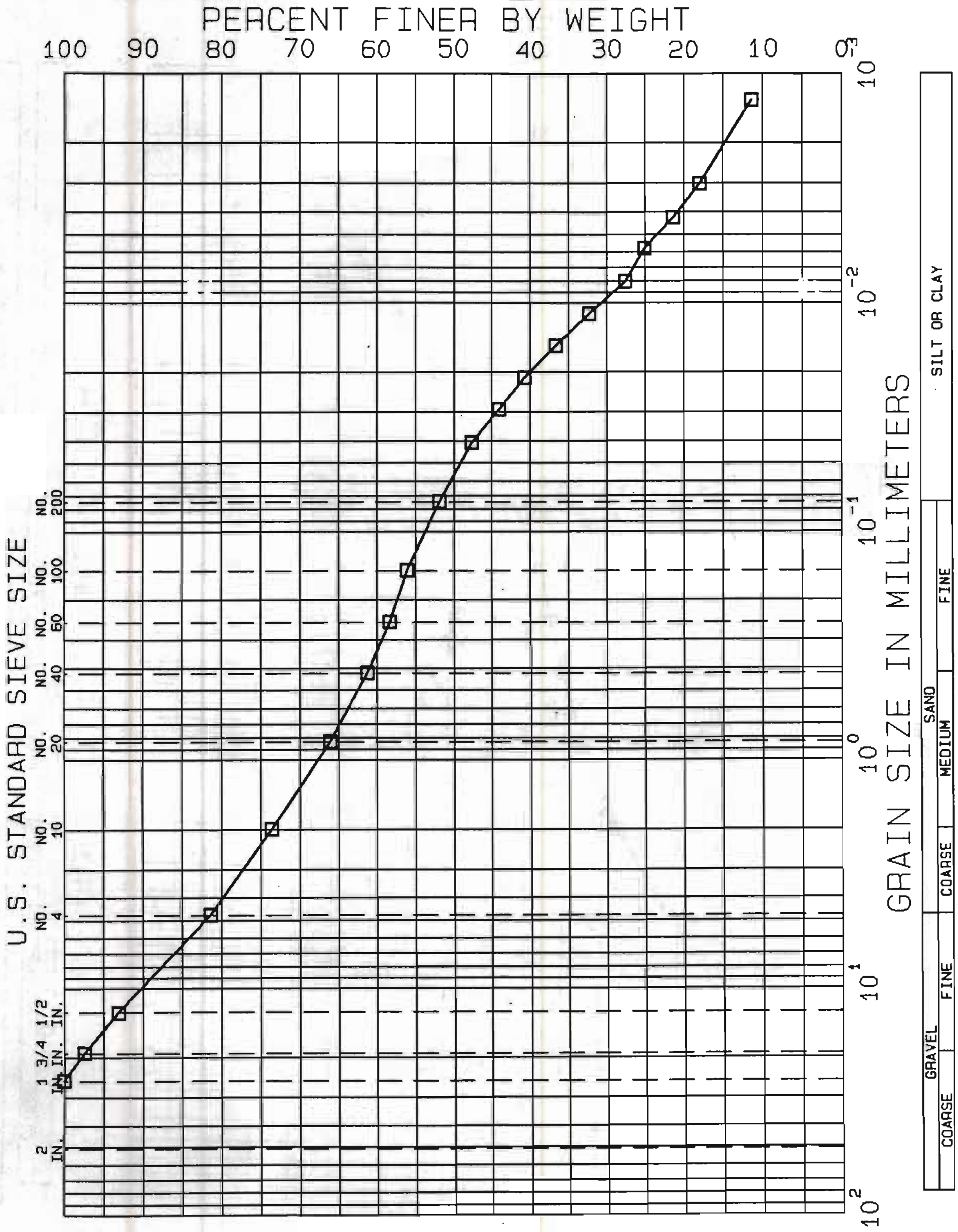
GRADATION TESTS

EXPLOR. NO. **MW-8D**
SANPLE NO. **80b**
DEPTH **11.0-12.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER NO. **1552**
DATE **1/2/92**

FILE **R5977.10**

DRAFT



TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	**Sample Location MW-8D** **Depth 43.0-44.0 ft.**	**Olive Sandy Lean Clay** **with Gravel (CL)**

WELLSVILLE-ANDOVER LANDFILL

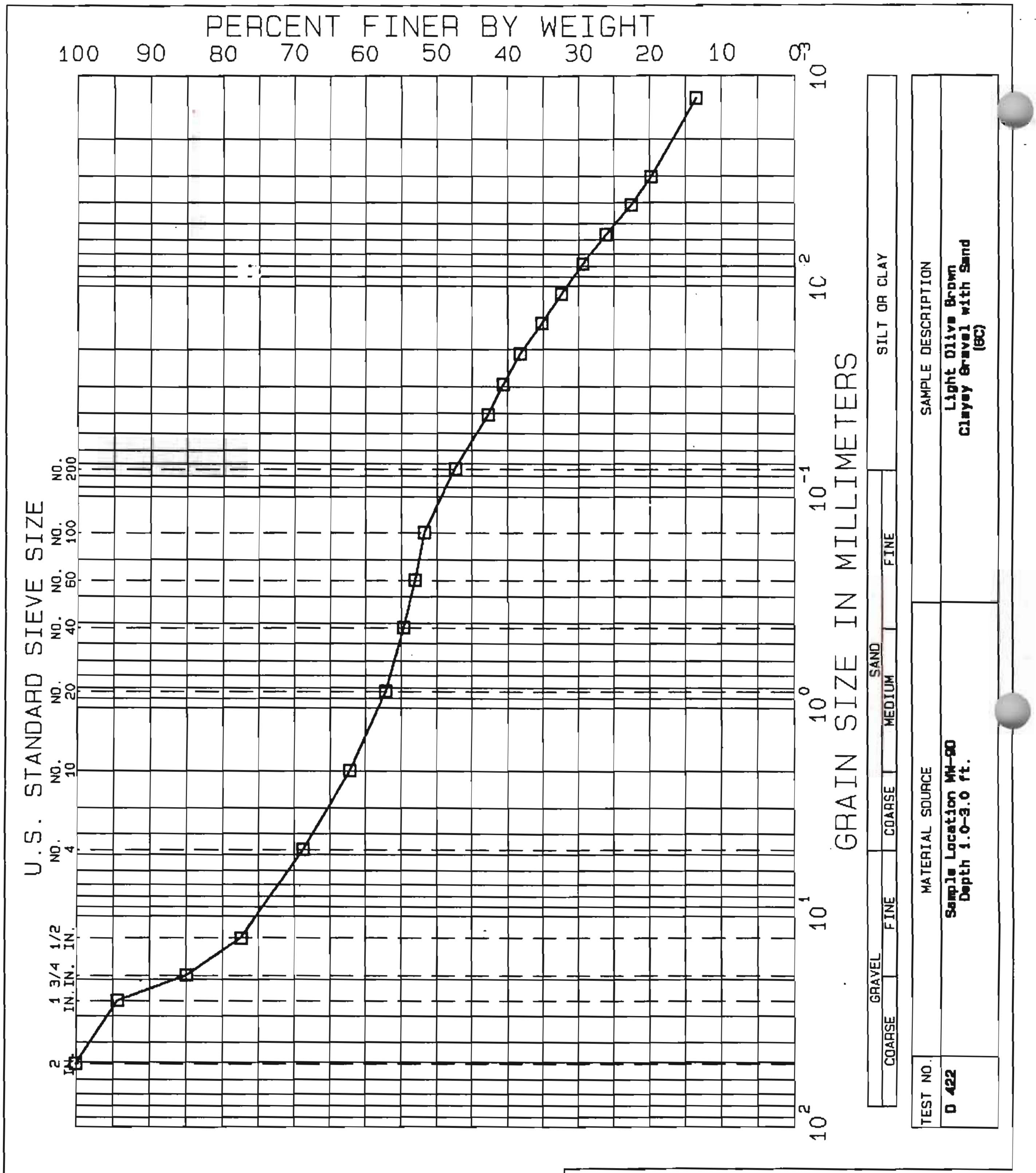
GRADATION TESTS

EXPLOR. NO. **MW-8D**
SAMPLE NO. **8Dc**
DEPTH **43.0-44.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER
NO. **1552**
DATE **1/2/92**

FILE **R5977.10**

D R A F T



TEST NO. **D 422**

MATERIAL SOURCE **Sample Location MW-90 Depth 1.0-3.0 ft.**

SAMPLE DESCRIPTION **Light Olive Brown Clayey Gravel with Sand (GC)**

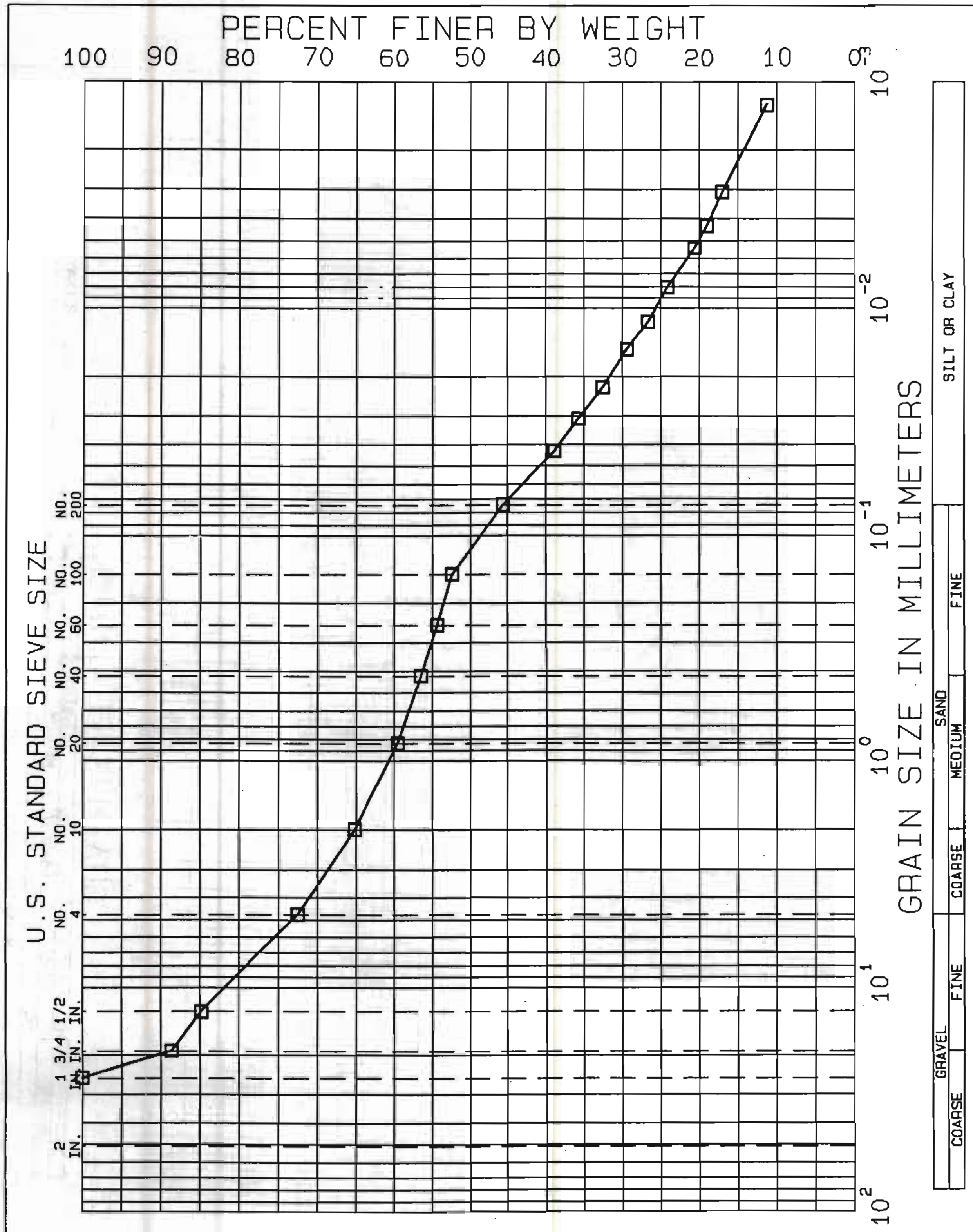
WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. **MW-90**
SAMPLE NO. **90a**
DEPTH **1.0-3.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER NO. **1552**
DATE **1/2/92**

FILE **R5977.10**



SAMPLE DESCRIPTION
Olive Brown Clayey Gravel with Sand (GC)

MATERIAL SOURCE
Sample Location MW-9D Depth 14.0-16.0 ft.

TEST NO. **D 422**

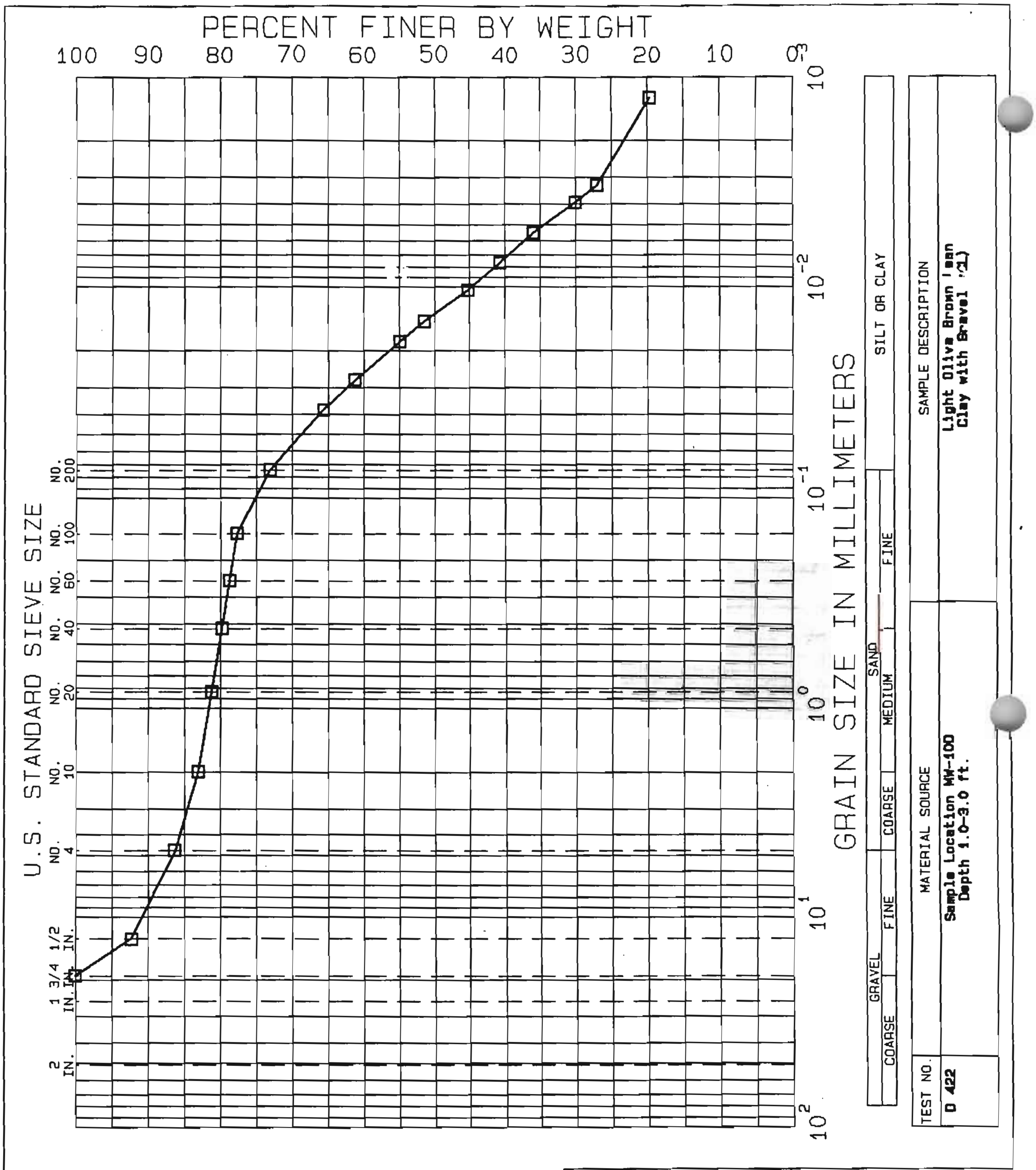
WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. **MW-9D**
SAMPLE NO. **9Db**
DEPTH **14.0-16.0 ft.**
TECH. **WGL**
REVIEWER **RAR**

WORK ORDER NO. **1552**
DATE **1/6/92**
FILE **R5977.10**

D R A F T



SAMPLE DESCRIPTION
Light Olive Brown lean Clay with Gravel (CL)

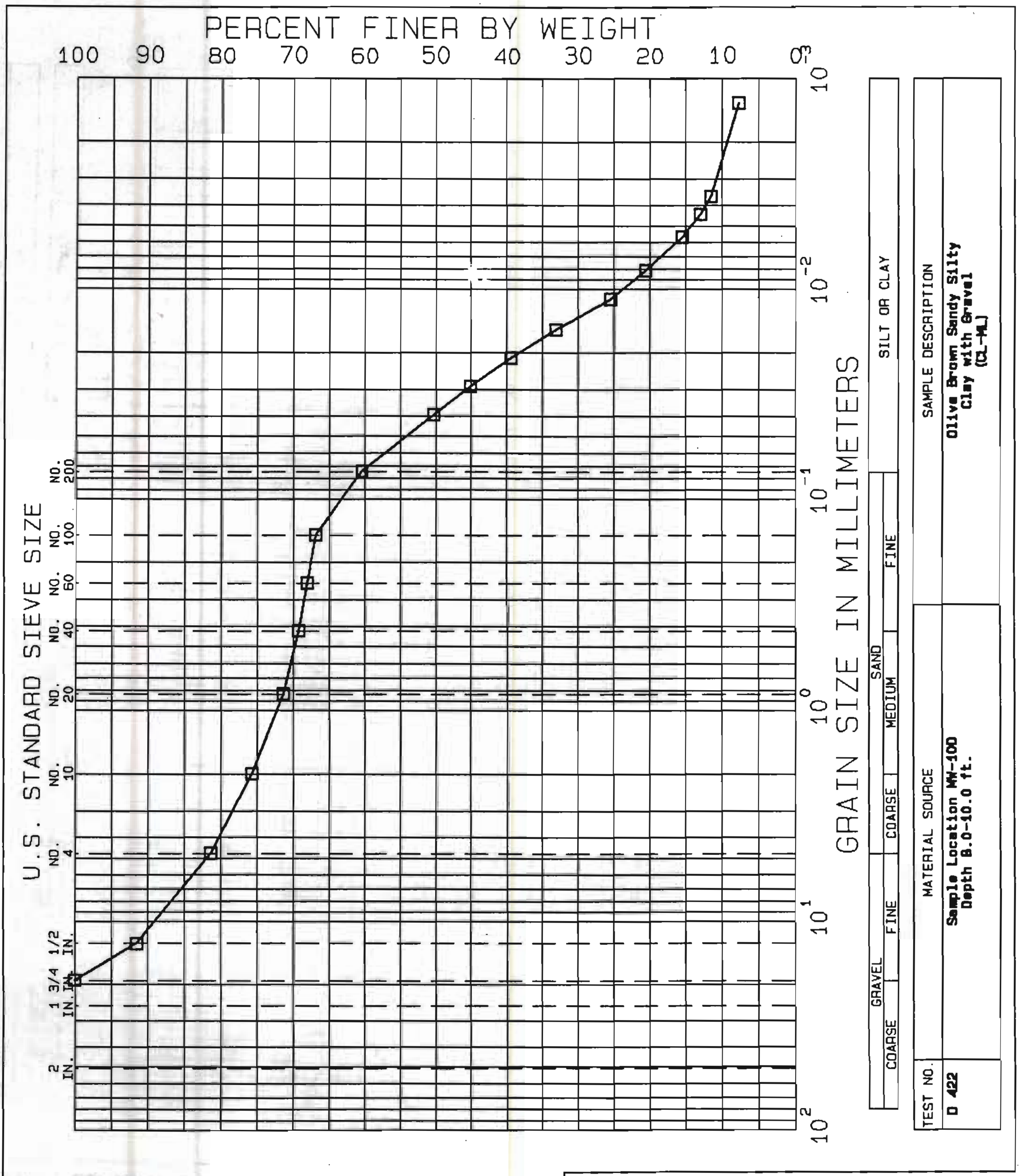
MATERIAL SOURCE
Sample Location MW-100
Depth 1.0-3.0 ft.

TEST NO.
D 422

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO.	MW-100	WORK ORDER NO.	1552
SAMPLE NO.	10Dm	DATE	1/6/92
DEPTH	1.0-3.0 ft.		
TECH.	WGL		
REVIEWER	RAR	FILE	R5977.10



WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO.	MW-10D	WORK ORDER NO.	1552
SAMPLE NO.	100b	DATE	1/8/92
DEPTH	8.0-10.0 ft.		
TECH.	WGL		
REVIEWER	RAR	FILE	R5977.10

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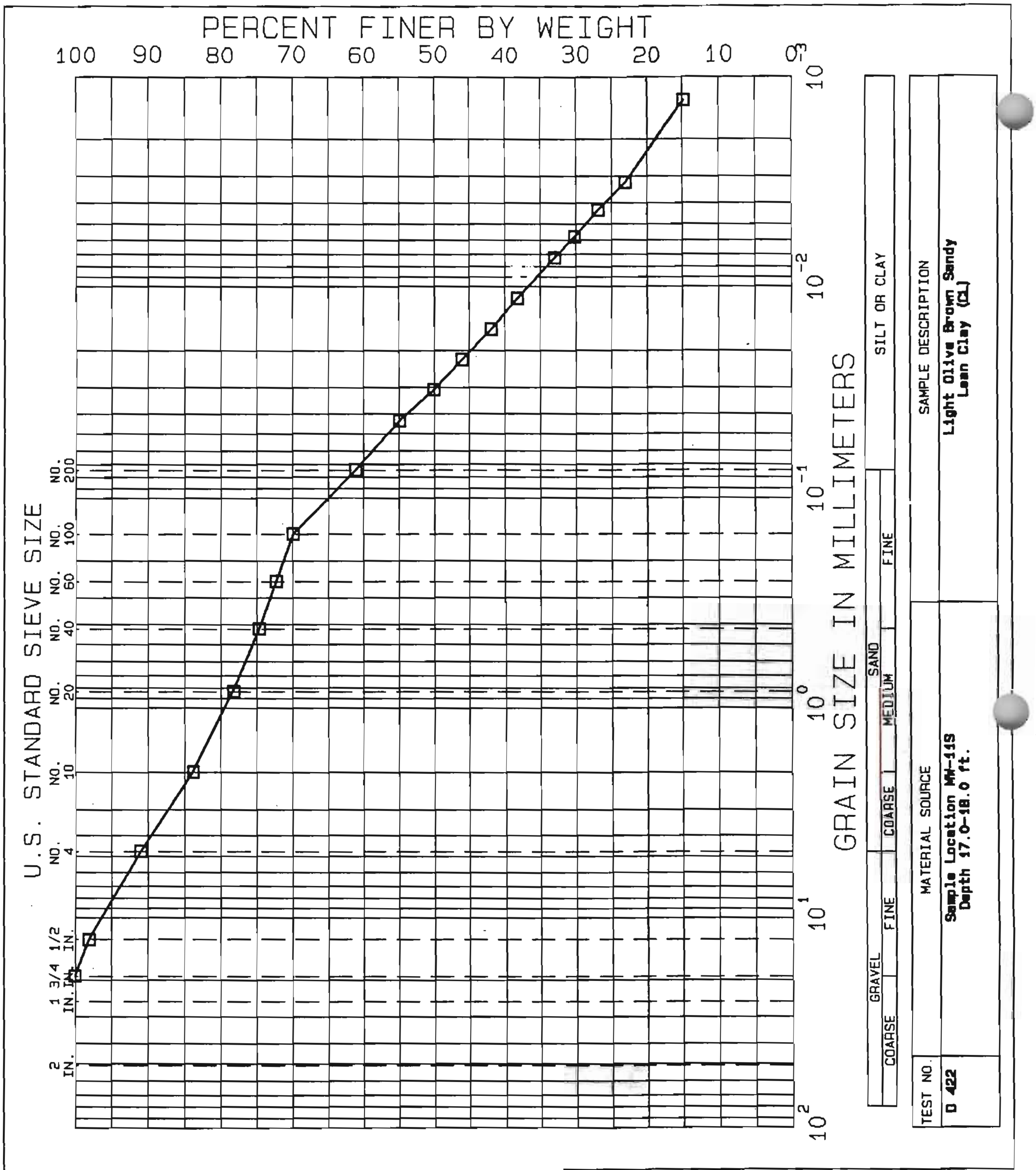


TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	Sample Location MW-11S Depth 17.0-18.0 ft.	Light Olive Brown Sandy Lean Clay (CL)

WELLSVILLE-ANDOVER LANDFILL

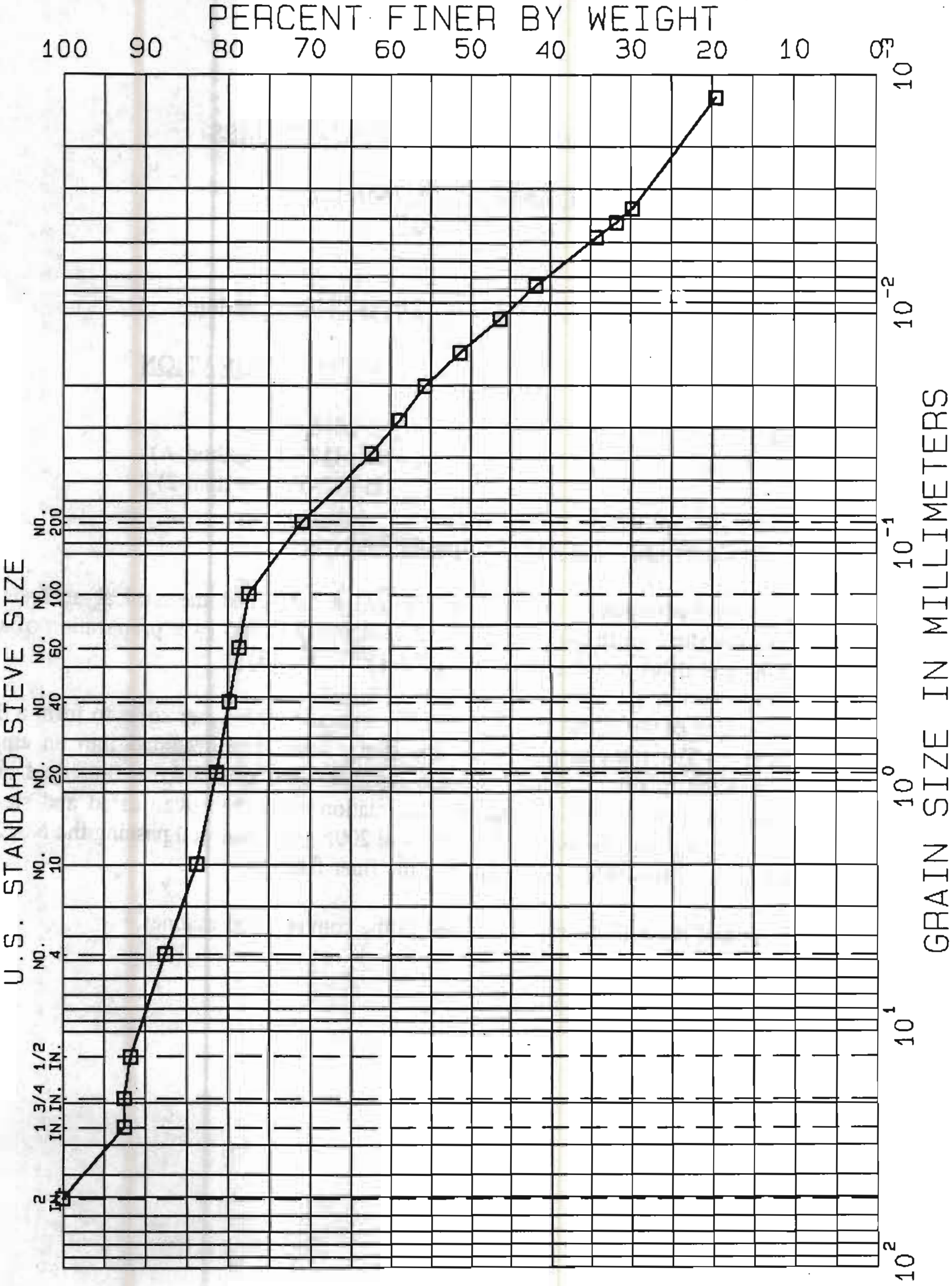
GRADATION TESTS

EXPLOR. NO. MW-11S
SANPLE NO. 11Sa
DEPTH 17.0-18.0 ft.
TECH. WGL
REVIEWER RAR

WORK ORDER
NO. 1552
DATE 1/6/92

FILE R5977.10

D R A F T



GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	Sample Location MILLERSPRING Depth 1.5-2.0 ft.	Light Olive Brown Silt with Sand (ML)

WELLSVILLE-ANDOVER LANDFILL

GRADATION TESTS

EXPLOR. NO. M.S.
SAMPLE NO. CL-1
DEPTH 1.5-2.0 ft.
TECH. WGL
REVIEWER RAR

WORK ORDER NO. 1552
DATE 1/5/92
FILE R5977.10

GZA GeoEnvironmental of New York
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GEOTECHNICAL LABORATORY TEST PROCEDURES

WELLSVILLE-ANDOVER LANDFILL
File No. R5977.10

1. The following tests were performed with the noted ASTM test designation:

TEST	ASTM DESIGNATION
Moisture Content	D 2216-80
Liquid and Plastic Limits	D 4318-84 (method A)
Grain Size	D 422-63 (see Item 2)

2. Test Procedures for Combined Sieve and Hydrometer Analysis

When both sieve and hydrometer analyses are required a combined mechanical analysis is performed. This procedure is, in part, similar to ASTM's D 2217-66 (wet preparation of soil sample for grain-size analysis and determination of soil constants-B).

A representative portion of the minus No. 4 material was mixed with water so as to form a thin homogeneous slurry. The fines suspended in this slurry were then decanted into an empty hydrometer jar, and the mixing-decanting process repeated until most of the fines had been removed. Coarser fractions remaining after the decantation were then oven dried and sieved through a nest of screens (Nos. 10, 20, 40, 60, 100, and 200). Any material passing the No. 200 screen was added to the hydrometer jar containing the finer fraction.

Hydrometer analysis of these fines was performed in the conventional manner.

APPENDIX F

RESULTS OF AIR SAMPLE ANALYSIS

D R A F T

9112069 Ecology & Environ.

AIR TOXICS LTD.

SAMPLE NAME: A-1
ID#: 9112069-01A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1123104**	**Date of Collection: 12/19/91**	
Dil. Factor:	**1400**	**Date of Analysis: 12/31/91**	

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	1400	Not Detected
Freon 114	1400	Not Detected
Chloromethane	1400	Not Detected
Vinyl Chloride	1400	12000
Bromomethane	1400	Not Detected
Chloroethane	1400	Not Detected
Freon 11	1400	Not Detected
1,1-Dichloroethene	1400	Not Detected
Freon 113	1400	Not Detected
Methylene Chloride	1400	Not Detected
1,1-Dichloroethane	1400	1700
cis-1,2-Dichloroethene	1400	55000
Chloroform	1400	Not Detected
1,1,1-Trichloroethane	1400	2300
Carbon Tetrachloride	1400	Not Detected
Benzene	1400	Not Detected
1,2-Dichloroethane	1400	Not Detected
Trichloroethene	1400	Not Detected
1,2-Dichloropropane	1400	Not Detected
trans-1,3-Dichloropropene	1400	Not Detected
Toluene	1400	5300
cis-1,3-Dichloropropene	1400	Not Detected
1,1,2-Trichloroethane	1400	Not Detected
Tetrachloroethene	1400	Not Detected
Ethylene Dibromide	1400	Not Detected
Chlorobenzene	1400	Not Detected
Ethyl Benzene	1400	15000
m,p-Xylene	1400	1800
o-Xylene	1400	Not Detected
Styrene	1400	Not Detected
1,1,2,2-Tetrachloroethane	1400	Not Detected
1,3,5-Trimethylbenzene	1400	Not Detected
1,2,4-Trimethylbenzene	1400	Not Detected
1,3-Dichlorobenzene	1400	Not Detected
1,4-Dichlorobenzene	1400	Not Detected
Chlorotoluene	1400	Not Detected
1,2-Dichlorobenzene	1400	Not Detected
1,2,4-Trichlorobenzene	1400	Not Detected
Hexachlorobutadiene	1400	Not Detected

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	**106**	**70-130**
4-Bromofluorobenzene	**109**	**70-130**
1,2-Dichlorobenzene-d4	**125**	**70-130**

F-2

9112069 Ecology & Environ.

AIR TOXICS LTD.

SAMPLE NAME: A-2
ID#: 9112069-02A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**5122713**	**Date of Collection: 12/19/91**
Dil. Factor:	**210**	**Date of Analysis: 12/27/91**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	210	2700
Freon 114	210	Not Detected
Chloromethane	210	Not Detected
Vinyl Chloride	210	9700
Bromomethane	210	Not Detected
Chloroethane	210	Not Detected
Freon 11	210	210
1,1-Dichloroethene	210	Not Detected
Freon 113	210	Not Detected
Methylene Chloride	210	860
1,1-Dichloroethane	210	1400
cis-1,2-Dichloroethene	210	87000 E
Chloroform	210	Not Detected
1,1,1-Trichloroethane	210	800
Carbon Tetrachloride	210	Not Detected
Benzene	210	240
1,2-Dichloroethane	210	Not Detected
Trichloroethene	210	390
1,2-Dichloropropane	210	Not Detected
trans-1,3-Dichloropropene	210	Not Detected
Toluene	210	4200
cis-1,3-Dichloropropene	210	Not Detected
1,1,2-Trichloroethane	210	Not Detected
Tetrachloroethene	210	Not Detected
Ethylene Dibromide	210	Not Detected
Chlorobenzene	210	Not Detected
Ethyl Benzene	210	7700
m,p-Xylene	210	370
o-Xylene	210	Not Detected
Styrene	210	Not Detected
1,1,2,2-Tetrachloroethane	210	Not Detected
1,3,5-Trimethylbenzene	210	Not Detected
1,2,4-Trimethylbenzene	210	Not Detected
1,3-Dichlorobenzene	210	Not Detected
1,4-Dichlorobenzene	210	Not Detected
Chlorotoluene	210	Not Detected
1,2-Dichlorobenzene	210	Not Detected
1,2,4-Trichlorobenzene	210	Not Detected
Hexachlorobutadiene	210	Not Detected

Container Type: 6 Liter SUMMA Canister

E = Exceeds instrument calibration range, but within linear range.

Surrogates	**% Recovery**	**Method Limits**
Octafluorotoluene	**107**	**70-130**
4-Bromofluorobenzene	**94**	**70-130**
1,2-Dichlorobenzene-d4	**99**	**70-130**

AIR TOXICS LTD.

SAMPLE NAME: A-3

ID#: 9112069-03A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**5122812**	**Date of Collection: 12/19/91**
Dil. Factor:	**3700**	**Date of Analysis: 12/28/91**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	3700	Not Detected
Freon 114	3700	Not Detected
Chloromethane	3700	Not Detected
Vinyl Chloride	3700	1700
Bromomethane	3700	Not Detected
Chloroethane	3700	Not Detected
Freon 11	3700	Not Detected
1,1-Dichloroethene	3700	Not Detected
Freon 113	3700	Not Detected
Methylene Chloride	3700	Not Detected
1,1-Dichloroethane	3700	Not Detected
cis-1,2-Dichloroethene	3700	100000
Chloroform	3700	Not Detected
1,1,1-Trichloroethane	3700	Not Detected
Carbon Tetrachloride	3700	Not Detected
Benzene	3700	Not Detected
1,2-Dichloroethane	3700	Not Detected
Trichloroethene	3700	Not Detected
1,2-Dichloropropane	3700	Not Detected
trans-1,3-Dichloropropene	3700	Not Detected
Toluene	3700	8600
cis-1,3-Dichloropropene	3700	Not Detected
1,1,2-Trichloroethane	3700	Not Detected
Tetrachloroethene	3700	Not Detected
Ethylene Dibromide	3700	Not Detected
Chlorobenzene	3700	Not Detected
Ethyl Benzene	3700	21000
m,p-Xylene	3700	Not Detected
o-Xylene	3700	Not Detected
Styrene	3700	Not Detected
1,1,2,2-Tetrachloroethane	3700	Not Detected
1,3,5-Trimethylbenzene	3700	Not Detected
1,2,4-Trimethylbenzene	3700	Not Detected
1,3-Dichlorobenzene	3700	Not Detected
1,4-Dichlorobenzene	3700	Not Detected
Chlorotoluene	3700	Not Detected
1,2-Dichlorobenzene	3700	Not Detected
1,2,4-Trichlorobenzene	3700	Not Detected
Hexachlorobutadiene	3700	Not Detected

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	106	70-130
4-Bromofluorobenzene	96	70-130
1,2-Dichlorobenzene-d4	100	70-130

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AIR TOXICS LTD.

SAMPLE NAME: A-4
ID#: 9112069-04A
Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1123105**	**Date of Collection: 12/19/91**
Dil. Factor:	**28**	**Date of Analysis: 12/31/91**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	28	1500
Freon 114	28	980
Chloromethane	28	Not Detected
Vinyl Chloride	28	1300
Bromomethane	28	Not Detected
Chloroethane	28	820
Freon 11	28	180
1,1-Dichloroethene	28	Not Detected
Freon 113	28	Not Detected
Methylene Chloride	28	Not Detected
1,1-Dichloroethane	28	55
cis-1,2-Dichloroethene	28	190
Chloroform	28	Not Detected
1,1,1-Trichloroethane	28	Not Detected
Carbon Tetrachloride	28	Not Detected
Benzene	28	Not Detected
1,2-Dichloroethane	28	Not Detected
Trichloroethene	28	Not Detected
1,2-Dichloropropane	28	Not Detected
trans-1,3-Dichloropropene	28	Not Detected
Toluene	28	520
cis-1,3-Dichloropropene	28	Not Detected
1,1,2-Trichloroethane	28	Not Detected
Tetrachloroethene	28	Not Detected
Ethylene Dibromide	28	Not Detected
Chlorobenzene	28	Not Detected
Ethyl Benzene	28	7900 E
m,p-Xylene	28	1600
o-Xylene	28	290
Styrene	28	Not Detected
1,1,2,2-Tetrachloroethane	28	Not Detected
1,3,5-Trimethylbenzene	28	Not Detected
1,2,4-Trimethylbenzene	28	34
1,3-Dichlorobenzene	28	Not Detected
1,4-Dichlorobenzene	28	Not Detected
Chlorotoluene	28	Not Detected
1,2-Dichlorobenzene	28	Not Detected
1,2,4-Trichlorobenzene	28	Not Detected
Hexachlorobutadiene	28	Not Detected

Container Type: 6 Liter SUMMA Canister

E = Exceeds instrument calibration range, but within linear range.

Surrogates	**% Recovery**	**Method Limits**
Octafluorotoluene	**114**	**70-130**
4-Bromofluorobenzene	**113**	**70-130**
1,2-Dichlorobenzene-d4	**116**	**70-130**

AIR TOXICS LTD.

SAMPLE NAME: A-5
ID#: 9112069-05A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1123110**	**Date of Collection: 12/19/91**
Dil. Factor:	**3.7**	**Date of Analysis: 12/31/91**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	3.7	16
Freon 114	3.7	3.8
Chloromethane	3.7	Not Detected
Vinyl Chloride	3.7	16
Bromomethane	3.7	Not Detected
Chloroethane	3.7	74
Freon 11	3.7	Not Detected
1,1-Dichloroethene	3.7	Not Detected
Freon 113	3.7	Not Detected
Methylene Chloride	3.7	Not Detected
1,1-Dichloroethane	3.7	6.9
cis-1,2-Dichloroethene	3.7	4.6
Chloroform	3.7	Not Detected
1,1,1-Trichloroethane	3.7	Not Detected
Carbon Tetrachloride	3.7	Not Detected
Benzene	3.7	150
1,2-Dichloroethane	3.7	Not Detected
Trichloroethene	3.7	4.4
1,2-Dichloropropane	3.7	Not Detected
trans-1,3-Dichloropropene	3.7	Not Detected
Toluene	3.7	5.7
cis-1,3-Dichloropropene	3.7	Not Detected
1,1,2-Trichloroethane	3.7	Not Detected
Tetrachloroethene	3.7	Not Detected
Ethylene Dibromide	3.7	Not Detected
Chlorobenzene	3.7	Not Detected
Ethyl Benzene	3.7	26
m,p-Xylene	3.7	46
o-Xylene	3.7	6.4
Styrene	3.7	Not Detected
1,1,2,2-Tetrachloroethane	3.7	Not Detected
1,3,5-Trimethylbenzene	3.7	Not Detected
1,2,4-Trimethylbenzene	3.7	Not Detected
1,3-Dichlorobenzene	3.7	Not Detected
1,4-Dichlorobenzene	3.7	Not Detected
Chlorotoluene	3.7	Not Detected
1,2-Dichlorobenzene	3.7	Not Detected
1,2,4-Trichlorobenzene	3.7	3.8
Hexachlorobutadiene	3.7	Not Detected

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	98	70-130
4-Bromofluorobenzene	103	70-130
1,2-Dichlorobenzene-d4	122	70-130

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AIR TOXICS LTD.

SAMPLE NAME: A-6
ID#: 9112069-06A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1123113**	**Date of Collection: 12/19/91**
Dil. Factor:	**3.0**	**Date of Analysis:**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	3.0	7.2
Freon 114	3.0	Not Detected
Chloromethane	3.0	Not Detected
Vinyl Chloride	3.0	6.6
Bromomethane	3.0	Not Detected
Chloroethane	3.0	46
Freon 11	3.0	Not Detected
1,1-Dichloroethene	3.0	Not Detected
Freon 113	3.0	Not Detected
Methylene Chloride	3.0	Not Detected
1,1-Dichloroethane	3.0	Not Detected
cis-1,2-Dichloroethene	3.0	Not Detected
Chloroform	3.0	Not Detected
1,1,1-Trichloroethane	3.0	Not Detected
Carbon Tetrachloride	3.0	Not Detected
Benzene	3.0	76
1,2-Dichloroethane	3.0	Not Detected
Trichloroethene	3.0	Not Detected
1,2-Dichloropropane	3.0	Not Detected
trans-1,3-Dichloropropene	3.0	Not Detected
Toluene	3.0	Not Detected
cis-1,3-Dichloropropene	3.0	Not Detected
1,1,2-Trichloroethane	3.0	Not Detected
Tetrachloroethene	3.0	Not Detected
Ethylene Dibromide	3.0	Not Detected
Chlorobenzene	3.0	Not Detected
Ethyl Benzene	3.0	11
m,p-Xylene	3.0	21
o-Xylene	3.0	3.2
Styrene	3.0	Not Detected
1,1,2,2-Tetrachloroethane	3.0	Not Detected
1,3,5-Trimethylbenzene	3.0	Not Detected
1,2,4-Trimethylbenzene	3.0	Not Detected
1,3-Dichlorobenzene	3.0	Not Detected
1,4-Dichlorobenzene	3.0	Not Detected
Chlorotoluene	3.0	Not Detected
1,2-Dichlorobenzene	3.0	Not Detected
1,2,4-Trichlorobenzene	3.0	Not Detected
Hexachlorobutadiene	3.0	Not Detected

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	122	70-130
4-Bromofluorobenzene	110	70-130
1,2-Dichlorobenzene-d4	117	70-130

AIR TOXICS LTD.

SAMPLE NAME: A-7

ID#: 9112069-07A

Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**1010208**	**Date of Collection: 12/19/91**
Dil. Factor:	**310**	**Date of Analysis: 1/2/92**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	310	Not Detected
Freon 114	310	Not Detected
Chloromethane	310	Not Detected
Vinyl Chloride	310	2600
Bromomethane	310	Not Detected
Chloroethane	310	Not Detected
Freon 11	310	Not Detected
1,1-Dichloroethene	310	Not Detected
Freon 113	310	Not Detected
Methylene Chloride	310	Not Detected
1,1-Dichloroethane	310	Not Detected
cis-1,2-Dichloroethene	310	16000
Chloroform	310	Not Detected
1,1,1-Trichloroethane	310	Not Detected
Carbon Tetrachloride	310	Not Detected
Benzene	310	Not Detected
1,2-Dichloroethane	310	Not Detected
Trichloroethene	310	Not Detected
1,2-Dichloropropane	310	Not Detected
trans-1,3-Dichloropropene	310	Not Detected
Toluene	310	1500
cis-1,3-Dichloropropene	310	Not Detected
1,1,2-Trichloroethane	310	Not Detected
Tetrachloroethene	310	Not Detected
Ethylene Dibromide	310	Not Detected
Chlorobenzene	310	Not Detected
Ethyl Benzene	310	5600
m,p-Xylene	310	990
o-Xylene	310	Not Detected
Styrene	310	Not Detected
1,1,2,2-Tetrachloroethane	310	Not Detected
1,3,5-Trimethylbenzene	310	Not Detected
1,2,4-Trimethylbenzene	310	Not Detected
1,3-Dichlorobenzene	310	Not Detected
1,4-Dichlorobenzene	310	Not Detected
Chlorotoluene	310	Not Detected
1,2-Dichlorobenzene	310	Not Detected
1,2,4-Trichlorobenzene	310	Not Detected
Hexachlorobutadiene	310	Not Detected

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	**99**	**70-130**
4-Bromofluorobenzene	**116**	**70-130**
1,2-Dichlorobenzene-d4	**89**	**70-130**

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AIR TOXICS LTD.

SAMPLE NAME: A-8
ID#: 9112069-08A

Summa CANISTER EPA METHOD TO-14   GC/MS Full Scan

File Name:	**1123112**	**Date of Collection: 12/20/91**
Dil. Factor:	**1.0**	**Date of Analysis: 12/31/91**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	1.0	Not Detected
Freon 114	1.0	Not Detected
Chloromethane	1.0	Not Detected
Vinyl Chloride	1.0	Not Detected
Bromomethane	1.0	Not Detected
Chloroethane	1.0	Not Detected
Freon 11	1.0	Not Detected
1,1-Dichloroethene	1.0	Not Detected
Freon 113	1.0	2.8
Methylene Chloride	1.0	1.6
1,1-Dichloroethane	1.0	Not Detected
cis-1,2-Dichloroethene	1.0	Not Detected
Chloroform	1.0	Not Detected
1,1,1-Trichloroethane	1.0	Not Detected
Carbon Tetrachloride	1.0	Not Detected
Benzene	1.0	Not Detected
1,2-Dichloroethane	1.0	Not Detected
Trichloroethene	1.0	Not Detected
1,2-Dichloropropane	1.0	Not Detected
trans-1,3-Dichloropropene	1.0	Not Detected
Toluene	1.0	Not Detected
cis-1,3-Dichloropropene	1.0	Not Detected
1,1,2-Trichloroethane	1.0	Not Detected
Tetrachloroethene	1.0	Not Detected
Ethylene Dibromide	1.0	Not Detected
Chlorobenzene	1.0	Not Detected
Ethyl Benzene	1.0	Not Detected
m,p-Xylene	1.0	Not Detected
o-Xylene	1.0	Not Detected
Styrene	1.0	Not Detected
1,1,2,2-Tetrachloroethane	1.0	Not Detected
1,3,5-Trimethylbenzene	1.0	Not Detected
1,2,4-Trimethylbenzene	1.0	Not Detected
1,3-Dichlorobenzene	1.0	3.6
1,4-Dichlorobenzene	1.0	Not Detected
Chlorotoluene	1.0	Not Detected
1,2-Dichlorobenzene	1.0	Not Detected
1,2,4-Trichlorobenzene	1.0	Not Detected
Hexachlorobutadiene	1.0	Not Detected

Container Type: 6 Liter SUMMA Canister

Surrogates	% Recovery	Method Limits
Octafluorotoluene	113	70-130
4-Bromofluorobenzene	107	70-130
1,2-Dichlorobenzene-d4	114	70-130

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AIR TOXICS LTD.

SAMPLE NAME: Lab Blank
ID#: 9112069-09A
Summa CANISTER EPA METHOD TO-14 GC/MS Full Scan

File Name:	**5122803**	**Date of Collection: NA**
Dil. Factor	**1.0**	**Date of Analysis: 12/28/91**

Compound	MDL (ppbv)	Amount (ppbv)
Freon 12	1.0	Not Detected
Freon 114	1.0	Not Detected
Chloromethane	1.0	Not Detected
Vinyl Chloride	1.0	Not Detected
Bromomethane	1.0	Not Detected
Chloroethane	1.0	Not Detected
Freon 11	1.0	Not Detected
1,1-Dichloroethene	1.0	Not Detected
Freon 113	1.0	Not Detected
Methylene Chloride	1.0	Not Detected
1,1-Dichloroethane	1.0	Not Detected
cis-1,2-Dichloroethene	1.0	Not Detected
Chloroform	1.0	Not Detected
1,1,1-Trichloroethane	1.0	Not Detected
Carbon Tetrachloride	1.0	Not Detected
Benzene	1.0	Not Detected
1,2-Dichloroethane	1.0	Not Detected
Trichloroethene	1.0	Not Detected
1,2-Dichloropropane	1.0	Not Detected
trans-1,3-Dichloropropene	1.0	Not Detected
Toluene	1.0	Not Detected
cis-1,3-Dichloropropene	1.0	Not Detected
1,1,2-Trichloroethane	1.0	Not Detected
Tetrachloroethene	1.0	Not Detected
Ethylene Dibromide	1.0	Not Detected
Chlorobenzene	1.0	Not Detected
Ethyl Benzene	1.0	Not Detected
m,p-Xylene	1.0	Not Detected
o-Xylene	1.0	Not Detected
Styrene	1.0	Not Detected
1,1,2,2-Tetrachloroethane	1.0	Not Detected
1,3,5-Trimethylbenzene	1.0	Not Detected
1,2,4-Trimethylbenzene	1.0	Not Detected
1,3-Dichlorobenzene	1.0	Not Detected
1,4-Dichlorobenzene	1.0	Not Detected
Chlorotoluene	1.0	Not Detected
1,2-Dichlorobenzene	1.0	Not Detected
1,2,4-Trichlorobenzene	1.0	Not Detected
Hexachlorobutadiene	1.0	Not Detected

Container Type: NA

Surrogates	% Recovery	Method Limits
Octafluorotoluene	**103**	**70-130**
4-Bromofluorobenzene	**94**	**70-130**
1,2-Dichlorobenzene-d4	**86**	**70-130**

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

11325 SUNRISE GOLD CIRCLE, SUITE 'E'
RANCHO CORDOVA, CA 95742
(916) 638-9892 • FAX (916) 638-9917

CHAIN OF CUSTODY RECORD

Page 1 of 1

PROJECT # 0B3030 PO # COLLECTED BY (Signature) Richard M. Watt

REMARKS Wellsville-Andover Landfill
All samples except A-8 are most likely in the 1-50 ppm range.

FIELD SAMPLE I.D.#	SAMPLING MEDIA (Tenax, Canister etc.)	DATE/TIME	ANALYSIS	VAC./PRESSURE	LAB I.D. #
A-1	Canister # 11302	12-19-91/1225	VOC's TO-14	2.0"Hg ~~11.0"Hg~~ SC	9112269-01A
A-2	" # 11303	12-19-91/1237	"	11.0"Hg	-02A
A-3	" # 11306	12-19-91/1246	"	9.0"Hg	-03A
A-4	" # 11305	12-19-91/1252	"	1.5"Hg	-04A
A-~~8~~5	" # 11300	12-19-91/1305	"	3.0"Hg	-05A
A-6	" # 11301	12-19-91/1305	"	3.5"Hg	-06A
A-7	" # 11299	12-19-91/1320	"	4.0"Hg	-07A
A-8	" # 11298	12-20-91/1400	"	4.0psi	-08A

RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME	RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME
Richard M. Watt 12-20-91/1500	12/22/91 1355		

LAB USE ONLY

SHIPPER NAME	AIR BILL #	OPENED BY: DATE/TIME	TEMP(°C)	CONDITION
Federal Express	7985706276			

CUSTOMER PACKAGE TRACKING NUMBER — PULL UP PURPLE TAB

REMARKS

DRAFT

APPENDIX G

PHOTOGRAPHIC LOG

The following are representative photos of various field activities performed during the Phase I RI. Additional photos are available upon request.

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PHOTOGRAPHIC RECORD

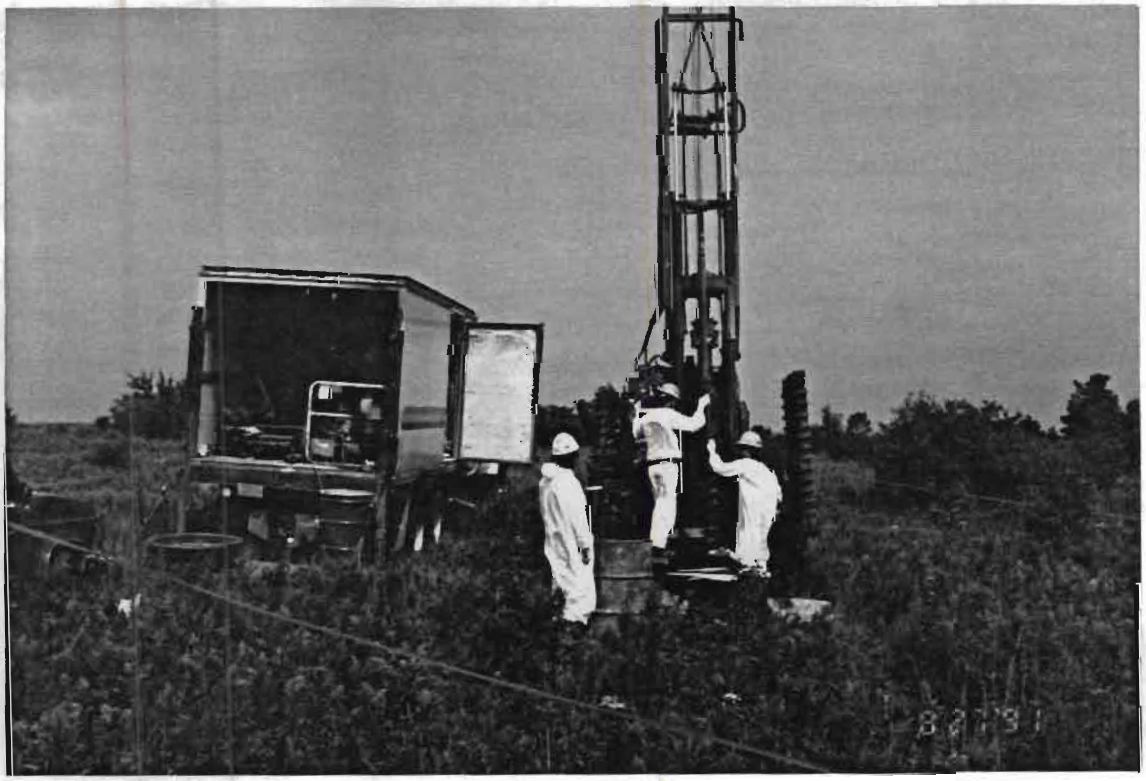
Client: NYSDEC -- Wellsville-Andover Landfill   E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330   SN: 14811609

Photographer: J. Hood   Date/Time: 8-27-91 / 1420

Lens: Type 38-105 MM   SN: NA   Frame No.: 1/1

Comments: View northeast of MW-1D drilling location during augering and split spoon sampling.



/

DRAFT

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PHOTOGRAPHIC RECORD

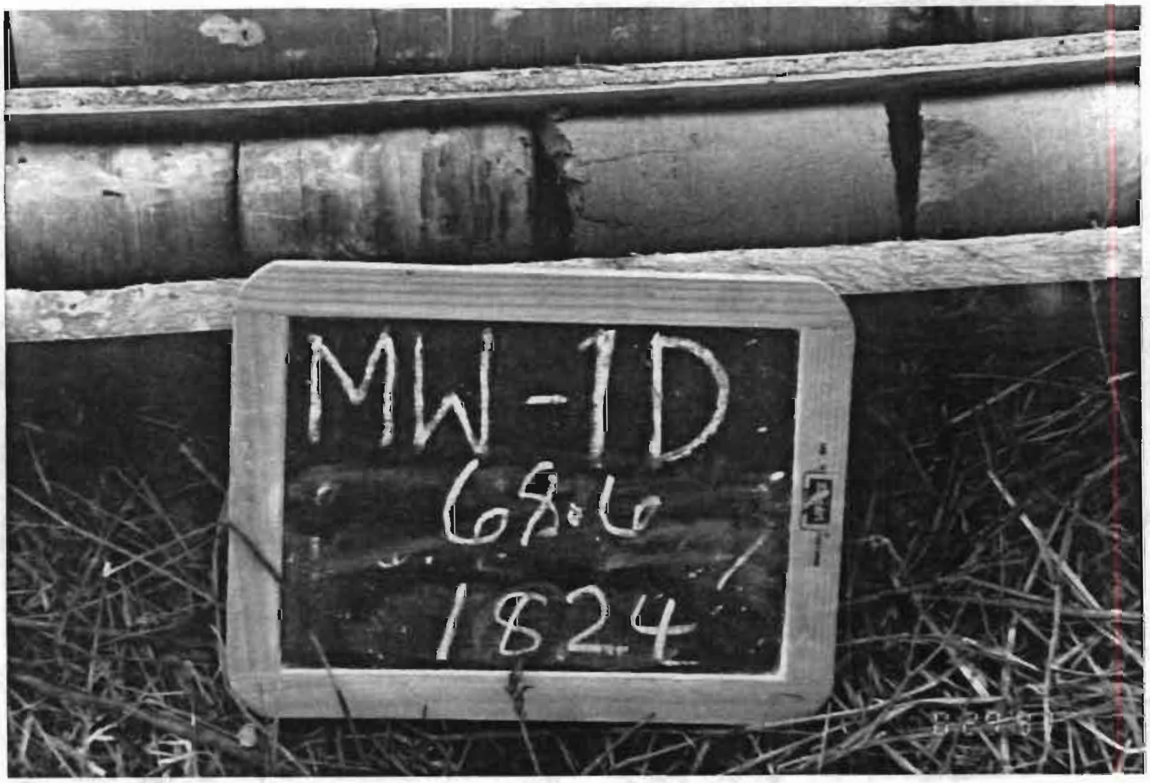
Client: NYSDEC -- Wellsville-Andover Landfill E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 14811609

Photographer: C. Waddell-Sheets Date/Time: 8-29-91 / 1824

Lens: Type 38-105 MM SN: NA Frame No.: 1/15

Comments: MW-1D; core run #8 at 68.6'. Clay-filled fracture at boundary between shale and siltstone. Down-core is to the right.



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PHOTOGRAPHIC RECORD

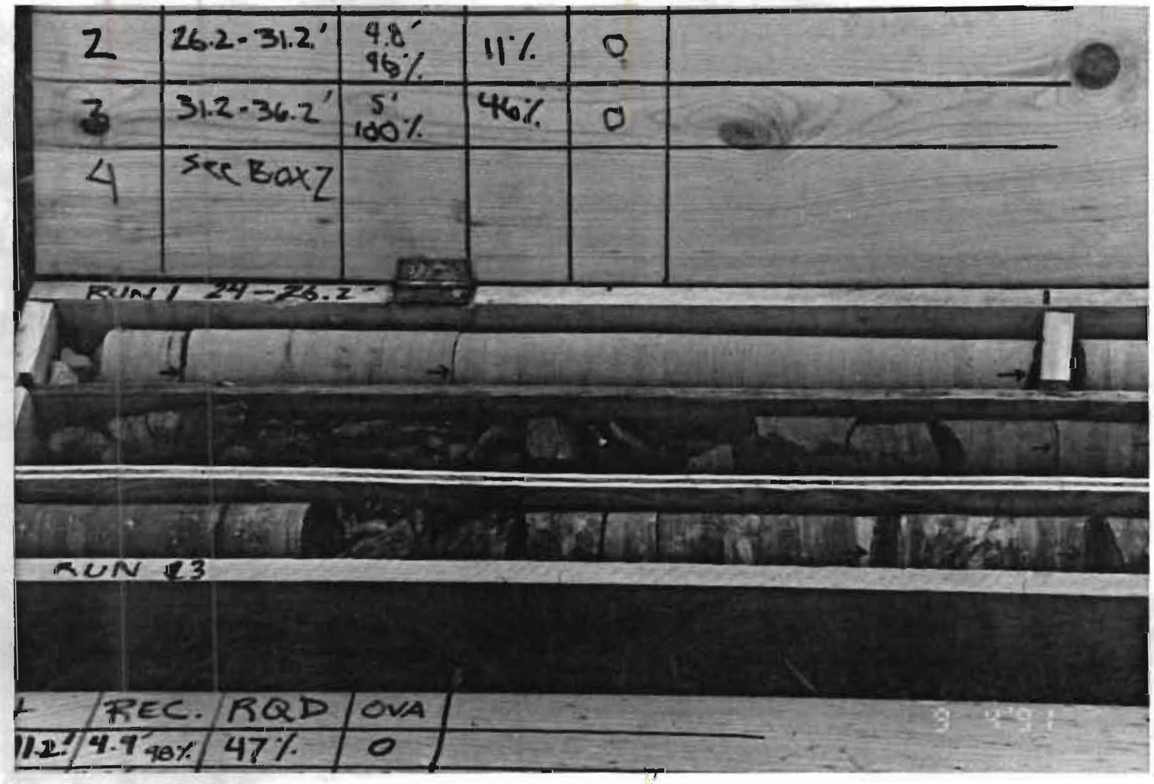
Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-4-91 / 1210

Lens: Type 38-105 mm SN: NA Frame No.: 1/19

Comments: MW-2D; heavily fractured zone from 27-28' in center trough. Down core is to the right.



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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-4-91 /1211

Lens: Type 38-105 mm SN: NA Frame No.: 1/21

Comments: MW-2D; vertical clay-filled fracture at 47' (in bottom trough). Down core is to the right.

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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-4-91 /1742

Lens: Type 38-105 MM SN: NA Frame No.: 1/24

Comments: View north from MW-2D across northern borrow pit. Ridge along skyline is northeast fill area.

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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-4-91 / 1742

Lens: Type 38-105 MM SN: NA Frame No.: 1/25

Comments: View west across northern borrow pit from MW-2D. Silver cylindrical structure at center is above-ground "manhole" in leachate collection system.

D R A F T

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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-16-91 / 1215

Lens: Type 38-105 MM SN: NA Frame No.: 1/34

Comments: View east across excess leachate holding pond after pond has been pumped dry.

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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation

E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330

SN: 1481609

Photographer: R. Watt

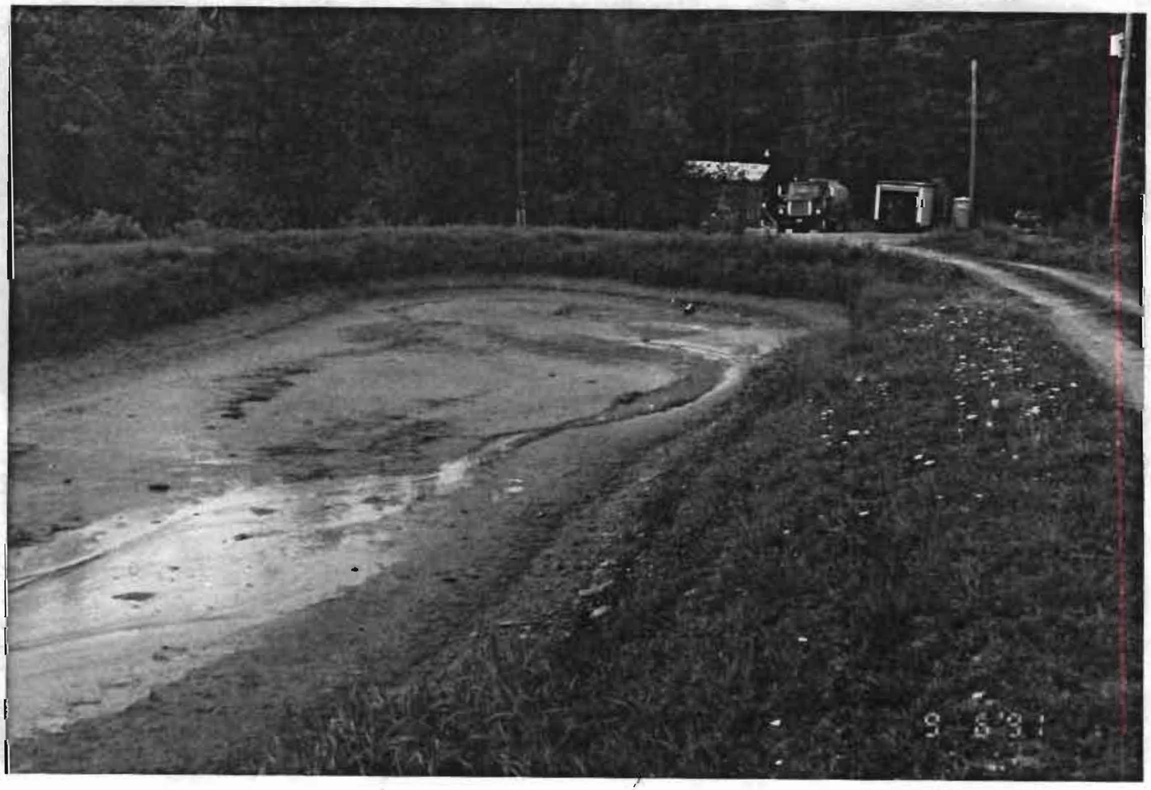
Date/Time: 9-6-91 / 1215

Lens: Type 38-105 mm

SN: NA

Frame No.: 1/35

Comments: View west across excess leachate holding pond. The late summer high water-line is evident. In background is pump house, pump truck and RI field trailer (from left to right).



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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-9-91 / 1642

Lens: Type 38-105 mm SN: NA Frame No.: 2/3

Comments: MW-4D; Top of core run #2 (11.3') is center left; bottom of run #2 (16.3') in bottom right. Note heavy weathering below competent rock.

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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: 0B3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-11-91 / 1454

Lens: Type 38-105 mm SN: NA Frame No.: 2/10

Comments: Close up of escaping gases at head of leachate seep pictured in Frame no. 2/9.

DRAFT

ecology and environment, inc.

PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-17-91 / 1120

Lens: Type 38-105 mm SN: NA Frame No.: 2/20

Comments: MW-10D; oxidized fracture at approx. 37' (center trough) in shaley sandstone/siltstone. Upper trough contains light grey, fine-grained sandstone; lower trough contains dark grey silty/sandy shale.

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PHOTOGRAPHIC RECORD

Client: New York State Department of Environmental Conservation E & E Job No.: OB3030

Camera: Make Olympus Infinity Super Zoom 330 SN: 1481609

Photographer: R. Watt Date/Time: 9-18-91 / 1205

Lens: Type 38-105 mm SN: NA Frame No.: 2/22

Comments: View northeast of MW-9D during augering.

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PHOTOGRAPHIC RECORD

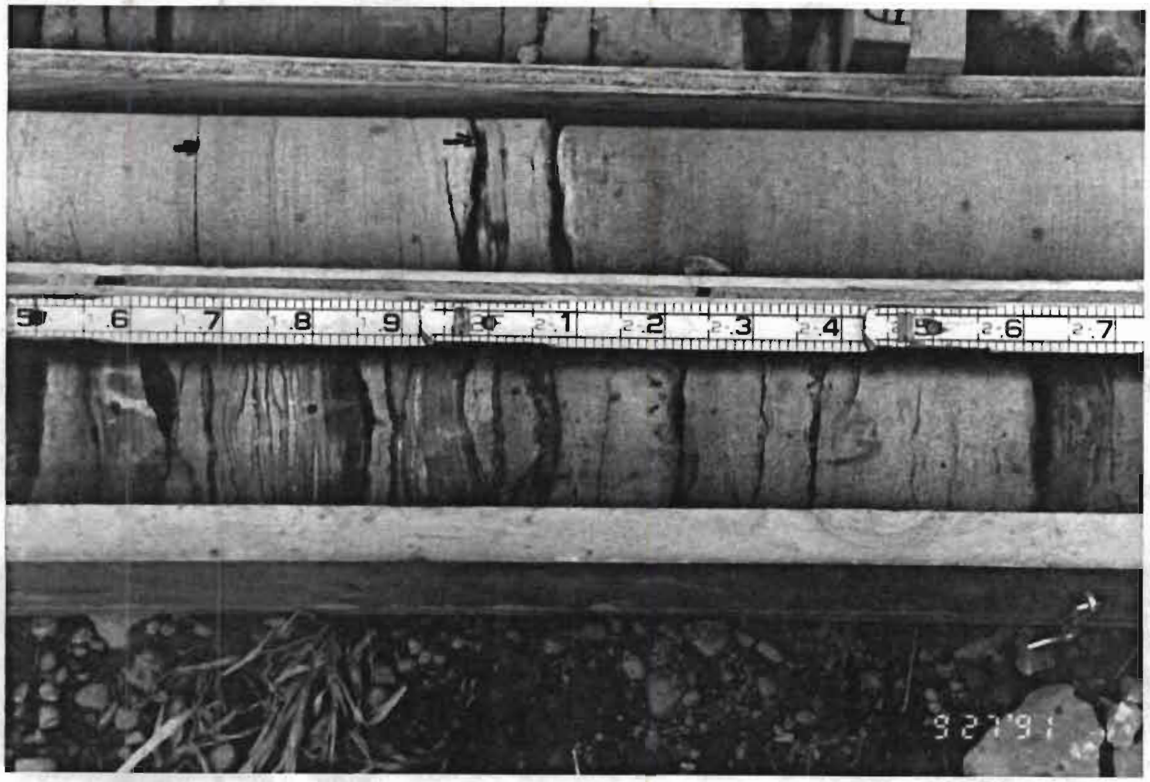
Client: NYSDEC - Wellsville-Andover Landfill **E & E Job No.:** 0B 3030

Camera: **Make** Olympus infinity super Zoom 330 **SN:** 1481609

Photographer: R. Watt **Date/Time:** 9-27-91 /1320

Lens: **Type** 38- 105mm **SN:** N/A **Frame No.:** 3/5

Comments: MW-8D; Core Run #3 (71-76'); irregular black shale interbeds at 73.0'. Down is to right



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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill

E & E Job No.: 0B 3030

Camera: Make Olympus infinity Super Zoom 330

SN: 1481609

Photographer: R. Watt

Date/Time: 10-1-91 / 1610

Lens: Type 38-105mm

SN: N/A

Frame No.: 3/9

Comments: View to the west from MW-7; Rosini house at left

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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill

E & E Job No.: OB 3030

Camera: Make Olympus infinity super Zoom 330

SN: 1481609

Photographer: R. Watt

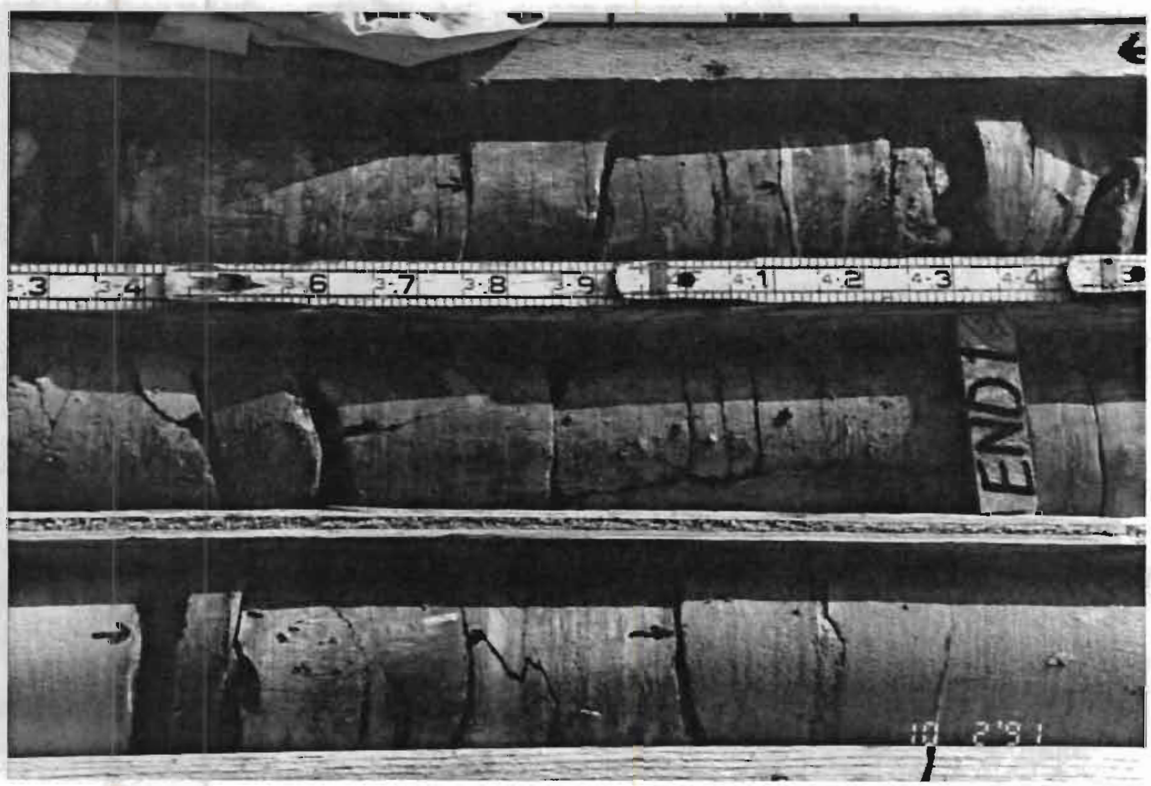
Date/Time: 10-2-91 / 0900

Lens: Type 38- 105 mm

SN: N/A

Frame No.: 3/11

Comments: MW-7D; Core Run #1 (26 - 30.3') Note vertcal Fracture at end of Run 1, down to right



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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill

E & E Job No.: 0B 3030

Camera: Make Olympus infinity Super Zoom 330

SN: 1481609

Photographer: R. Watt

Date/Time: 10-2-91/0955

Lens: Type 38-105mm

SN: N/A

Frame No.: 3/13

Comments: Sampling location SW/Sed-6; view upstream

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PHOTOGRAPHIC RECORD

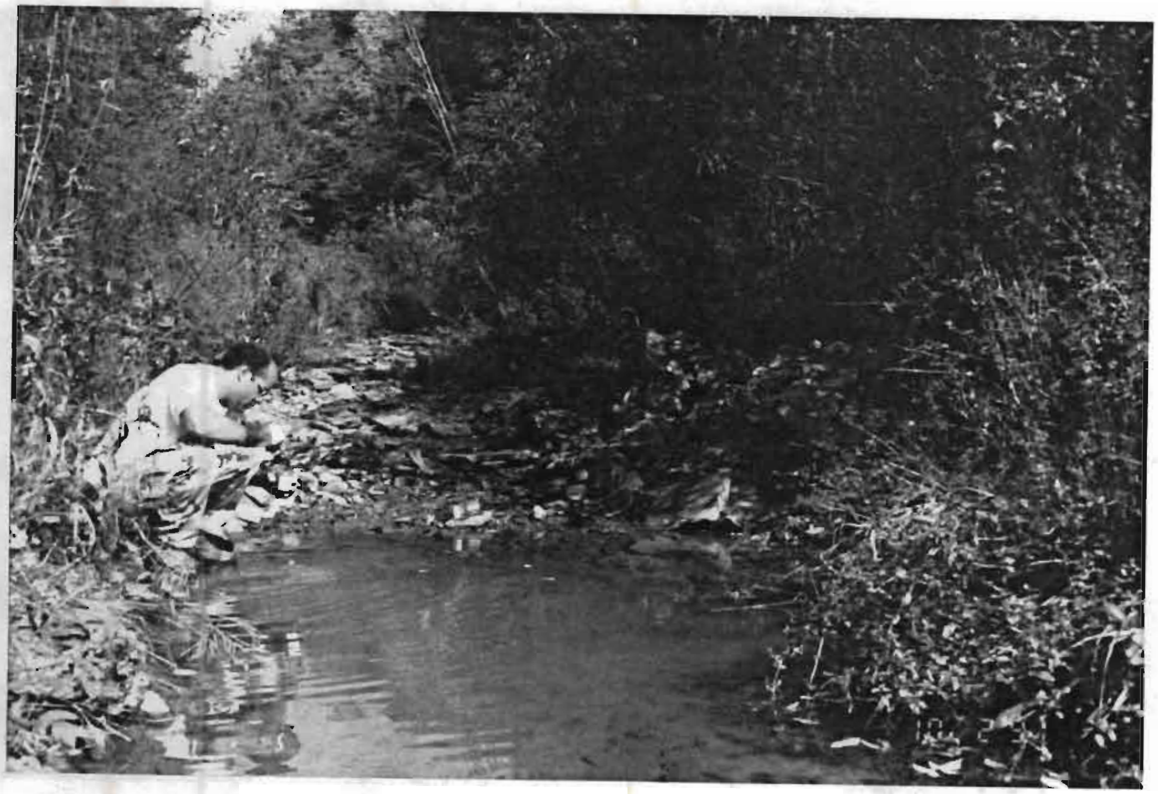
Client: NYSDEC - Wellsville-Andover Landfill **E & E Job No.:** OB 3030

Camera: Make Olympus infinity super Zoom 330 **SN:** 1481609

Photographer: R. Watt **Date/Time:** 10-2-91/1124

Lens: Type 38- 105 mm **SN:** N/A **Frame No.:** 3/15

Comments: R. Meyers sampling at SW/sed 4; view upstream



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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill

E & E Job No.: 0B 3030

Camera: Make Olympus infinity super Zoom 330

SN: 1481609

Photographer: R. Watt

Date/Time: 10-2-91 / 1445

Lens: Type 38- 105 mm

SN: N/A

Frame No.: 3/20

Comments: Sample location sw/sed-1; view upstream

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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill **E & E Job No.:** OB 3030

Camera: Make Olympus infinity super Zoom 330 **SN:** 1481609

Photographer: R. Watt **Date/Time:** 12-18-91 / 1510

Lens: Type 38- 105 mm **SN:** N/A **Frame No.:** 4/4

Comments: Drum uncovered in TP-4; view from east

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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill
E & E Job No.: 0B 3030

Camera: Make Olympus infinity Super Zoom 330
SN: 1481609

Photographer: R. Watt
Date/Time: 12-18-91 /1510

Lens: Type 38- 105mm
SN: N/A
Frame No.: 4/6

Comments: Plastic buttons ~1" diameter at TP-4

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PHOTOGRAPHIC RECORD

Client:	NYSDEC - Wellsville-Andover Landfill	**E & E Job No.:**	OB 3030
Camera: Make	Olympus infinity super Zoom 330	**SN:**	1481609

Photographer: R. Watt

Date/Time: 12-18-91 / 1518

Lens: Type 38- 105 mm

SN: N/A

Frame No.: 4/7

Comments: Close up (105 mm lens) of plastic buttons and forms in TP-4

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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill

E & E Job No.: 0B 3030

Camera: Make Olympus infinity super Zoom 330

SN: 1481609

Photographer: R. Watt

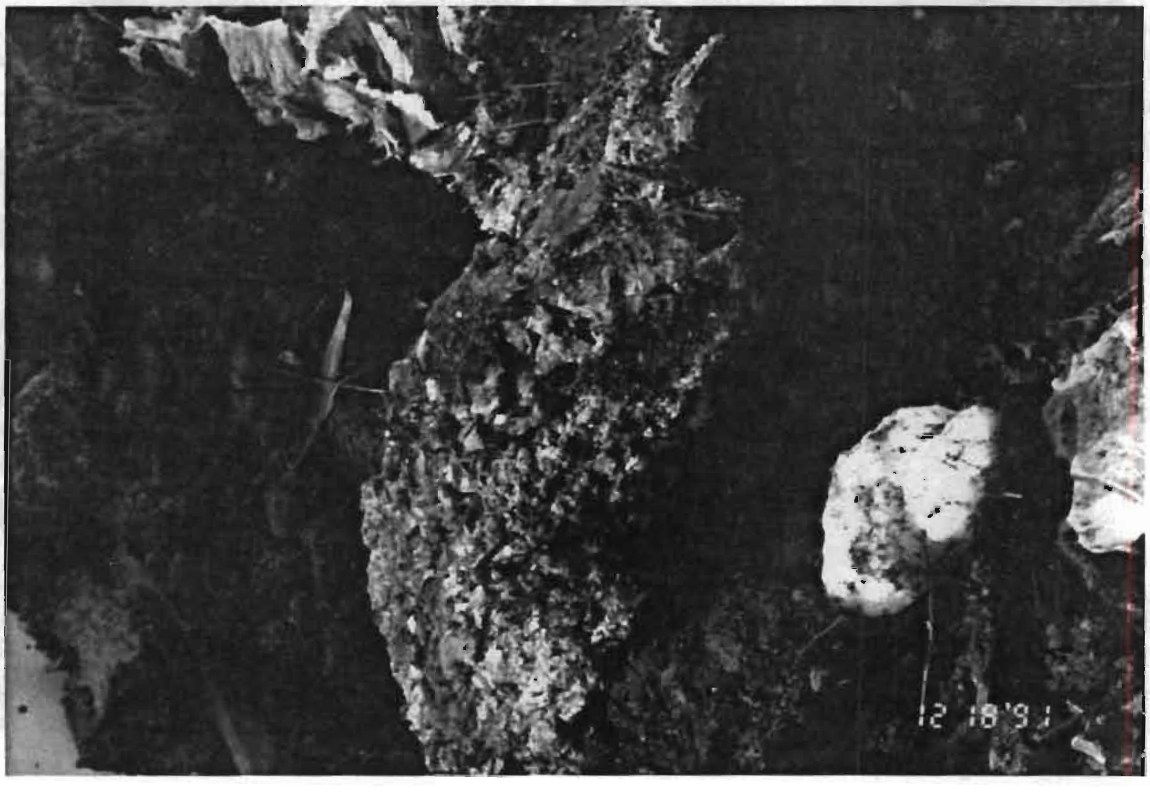
Date/Time: 12-18-91 / 1518

Lens: Type 38 - 105 mm

SN: N/A

Frame No.: 4/8

Comments: Close up of pink solid material from drums in TP-4



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PHOTOGRAPHIC RECORD

Client: NYSDEC - Wellsville-Andover Landfill **E & E Job No.:** OB 3030

Camera: Make Olympus infinity Super Zoom 330 **SN:** 1481609

Photographer: R. Watt **Date/Time:** 12-19-91/1020

Lens: Type 38-105mm **SN:** N/A **Frame No.:** 4/10

Comments: Trenching at TP-1; view to the north

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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill

E & E Job No.: 0B3030

Camera: Make Olympus Infinity Super Zoom 330

SN: 1481609

Photographer: R. Klott

Date/Time: 12-19-91 / 1400

Lens: Type 38-105 mm

SN: NA

Frame No.: 4-19

Comments: Close-up of Material excavated from TP-2

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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill

E & E Job No.: 0B3030

Camera: Make Olympus Infinity Super Zoom 330

SN: 1481609

Photographer: R. Watt

Date/Time: 12-19-91 / 1600

Lens: Type 38-105 mm

SN: NA

Frame No.: 4-24

Comments: View east from Snyder Road across leachate holding pond

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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill E & E Job No.: 083030

Camera: Make Nikon Nikkormat EL SN: 5284465

Photographer: Judy Vangalio Date/Time: 10-24-91 / 1136

Lens: Type 50 mm SN: NA Frame No.: H-3

Comments: Looking South along Duffy Creek at upstream benthos sampling location.

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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill E & E Job No.: 0B3030

Camera: Make Nikon Nikkormat EL SN: 5284465

Photographer: Larry Western Date/Time: 10-24-91/ 1307

Lens: Type 50 MM SN: NA Frame No.: H-6

Comments: Looking east along tributary to Duffy Creek, showing benthos sampling point.

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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill

E & E Job No.: 0B3030

Camera: Make Nikon Nikkormat EL

SN: 5284465

Photographer: Larry Western

Date/Time: 10-24-91/1400

Lens: Type 50 MM

SN: NA

Frame No.: H-8

Comments: Looking south towards south area. Foreground shows typical patch of reduced grass cover due to gravel and moss growth.

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PHOTOGRAPHIC RECORD

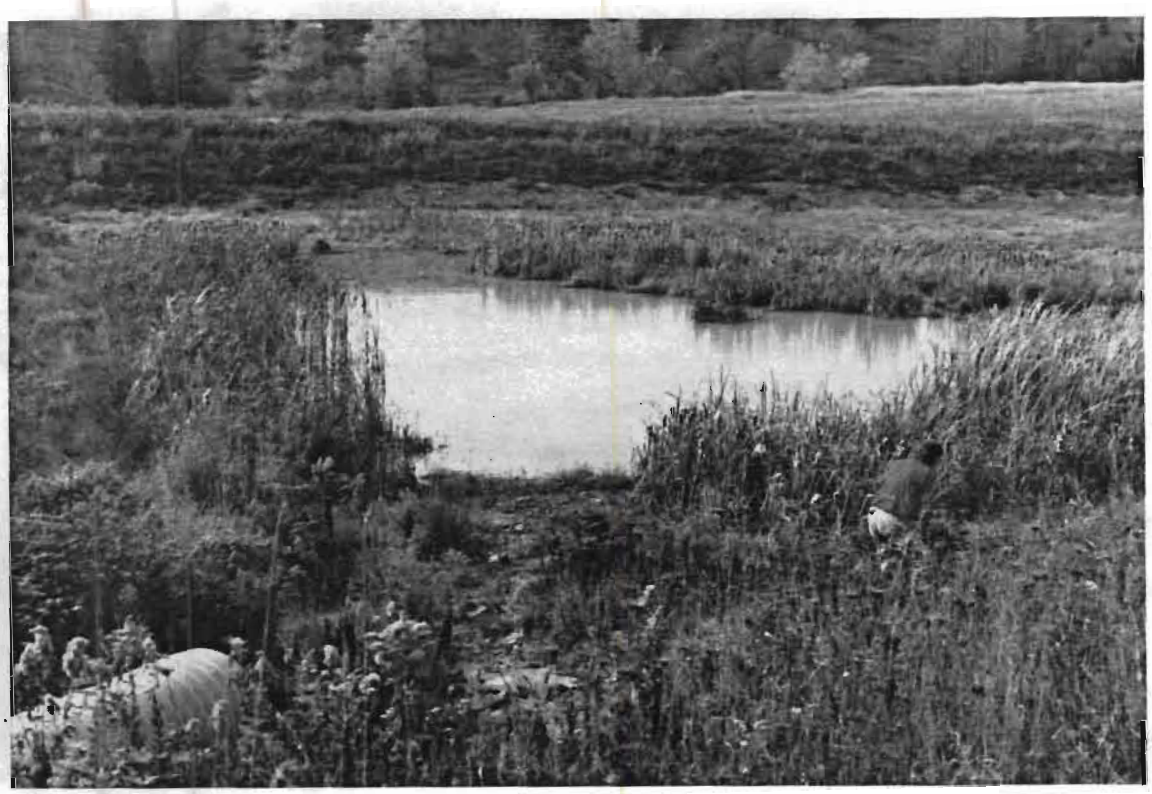
Client: NYSDEC -- Wellsville-Andover Landfill E & E Job No.: 0B3030

Camera: Make Nikon Nikkornat EL SN: 5284465

Photographer: Larry Western Date/Time: 10-24-91/ 1415

Lens: Type 50 MM SN: NA Frame No.: H-9

Comments: Looking west across drainage collection pond. Swale drainpipe in foreground.



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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill **E & E Job No.:** 083030

Camera: Make Nikon Nikkormat EL **SN:** 5284465

Photographer: Larry Western **Date/Time:** 10-24-91/ 1505

Lens: Type 50 MM **SN:** NA **Frame No.:** H-13

Comments: Looking north along westernmost leachate collection system line.

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PHOTOGRAPHIC RECORD

Client: NYSDEC -- Wellsville-Andover Landfill

E & E Job No.: 0B3030

Camera: Make Nikon Nikkormat EL

SN: 5284465

Photographer: Larry Western

Date/Time: 10-24-91/ 1631

Lens: Type 50 MM

SN: NA

Frame No.: H- 18

Comments: Sump dug on Miller property showing water perched on clay layer. Miller spring sample (DW-6) collected here.